THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. SEPTEMBER 16, 1897. CHICAGO, ILL. NUMBER 37.

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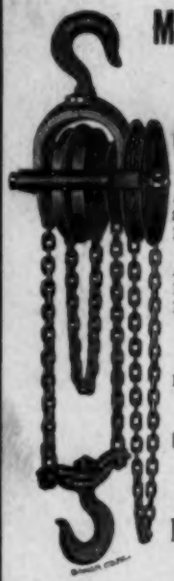

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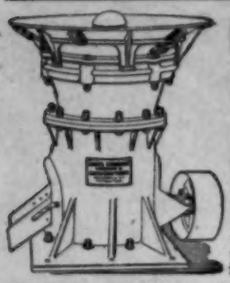

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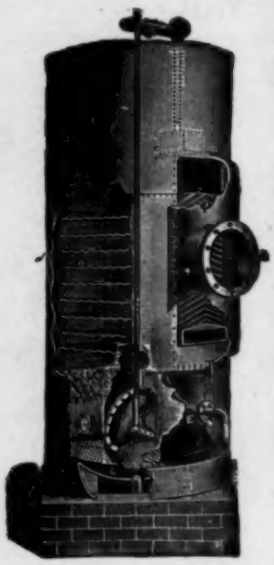

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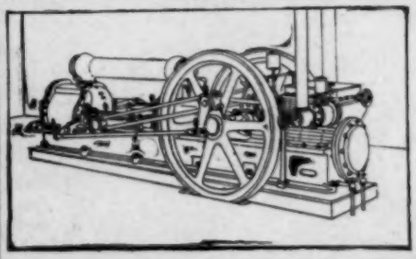

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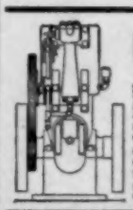

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. SEPTEMBER 16, 1897. CHICAGO, ILL. NUMBER 37

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The longer the improvement in the iron trade keeps up, the more signs it gives of health and permanence. In the past week ground has been gained —additional firmness, with some sharp advances, in pig iron, while in finished lines demand has kept up well, with additional strength in prices. The situation as to pig iron has reached a stage at which it is more closely studied by both buyer and seller. An increase of 20,000 tons in weekly production between Aug. 1 and Sept. 1, or at the rate of 1,000,000 tons additional in a year, accompanied by further reductions in stocks on hand, is indicative of consumption unequaled in many months. With the additions already made since Sept. 1 to the active list, and those scheduled for the remainder of the month, it is evident that by Oct. 1 production will be fully up to that at the opening of 1896, when the boom of 1895 still strongly affected furnace operations. To-day the country is producing iron at the rate of 10,000,000 tons a year, and the fact that 15 per cent fewer furnaces are now active than when this rate was last current, in the late spring of 1896, is an index to the efficiency of the plants in operation, as well as to the fact that only the fittest are eligible on the price basis of to-day. The week has established the higher prices asked for Southern iron, though those of the leading interest, which is practically out of the market for further 1896 business, are fully 25 cents a ton above the actual market. Northern sellers of foundry iron are stronger also, under the growing demand due to the larger amount of work finding its way into foundries. Bessemer iron is 50 cents higher for 1896 delivery, and sales have been made ashigh as $9.75 and $9.85, valley furnace, delivery in the balance of the year, while most valley furnaces are now holding for $10 for deliveries in the first half of 1898. The advance over last week shows the sensitive condition of the market and its quick response to a buying movement. Sales of the week have been quite heavy. Production of Bessemer iron is increasing at the same time and September additions to active valley furnaces will number six or seven. Gray forge also shows a marked advance, going to $9.15 Pittsburg, with sales ranging from $8.75 to that figure. For immediate delivery it is now practically impossible to get mill iron in Pittsburg or valley districts. Steel billets have advanced further, and $15.50 at maker's mill, Pittsburg, has been reached. It is commonly quoted to-day, the scarcity of steel for 1897 delivery having been further emphasized. The market for finished material has shown a steady growth of demand, and many mills are booking more than their current shipments. But all are not so fortunate, and large orders still bring out considerable variations in price. Rods and all wire products are very firm, and $1.40 base for wire nails is now the selling price at Central Western mills. Reports of arrangemnts to limit production are current, but are not authenticated. Plate mills are well engaged, structural business is of large volume, and bars and sheets are firmer in all markets. Railroad demand is broadening, and bar mills are holding for about $1 advance over the basis of two weeks ago.

THE CLEVELAND DISTRICT.

Ore selling has brought the trade to the point at which very little association ore is available, and on the lots yet to be disposed of it is to be expected that an advance in price will be secured. Non-Bessemers, early sales of which were based on the 40 and 45 cent rate from Escanaba, have sold enough higher, of late, to cover lake freight advances. The freight market to-day is easy at 55, 65 and 70 cents, Escanaba, Marquette and the head of Lake Superior. Coal shipments will not begin until the middle of next week , and in the last few days a car scarcity at Buffalo has retarded the grain movement. It is evident that ore shippers are not anxious for wild tonnage, so that coal and grain will be the chief support of the situation from this time out. Ore circles still take a lively interest in the pending negotiations for Gogebic properties by the Oliver Mining Co, representing the Carnegie and Oliver companies. It may be said that no arrangement for the Tilden mine has been completed as yet, though negotiations are still going on, and the property will no doubt be taken if certain conditions now under discussion are complied with. The Norrie negotiations stand practically as stated a week ago. The options obtained cover considerably more than a majority of the stock. The effect of ownership of old-range Bessemer properties by the leading Pittsburg interest is being discussed as though such ownership were accomplished fact, as indeed it may be taken to be, the uncertain quantity being its extent. It is evident that the days of any considerable fluctuation in ore prices and therefore of any large profits in iron mining will not return. The effort seems to be, on the part of great steel interests, not so much to insure a lower ore cost than is possible to some home competitor—for this year has shown that a low cost to one means a low cost to all—but rather to make sure of the lowest attainable cost, as against the world. In other words, the foreign market rather than the home market is the shaper of policy. It would not be surprising, therefore, to see further steps in the direction of concentration, by other important steel interests.

Pig Iron

Valley furnaces have had a genuine revival of demand on their hands in the past week. Bessemer pig has advanced 50 cents a ton on 1897 deliveries. One steel company in Ohio is reported to have taken 30,000 tons for 1897, in the latter part of last week, most of it at $9.50 valley furnace. Purchases by other interests followed, some of the latter evidently speculative. One sale of 3,000 tons is reported at $9.75, valley, and in another case $9.85 is said to have been reached. To-day furnaces are firm in asking $10 for the first quarter of 1898 and a deal is now pending which promises to be closed on that basis. Gray forge has also scored a notable advance in the week. From $8.25 to $8.50 at valley furnace, asked last week, $9 is now quoted. We note a sale of 1,000 tons at $8.90 in the valley. At Pittsburg, sellers are out of the market and several inquiries are in the hands of valley producers, metal for prompt shipment being limited to one or two small lots. Foundry iron is still in good inquiry and it is plain that the aggregate of foundry work is increasing. For No. 2, most sellers ask $9.25, but $9 has been done. There is no guarantee as to the price of coke after Jan. 1 and furnacemen are chary of 1898 sales except at an advance over to-day's basis. We quote f. o. b. Cleveland:

Bessemer	$10 25@10 50	Valley Scotch No. 1	$10 40@10 65
No. 1 Strong Foundry	10 25@10 65	Valley Scotch No. 2	9 75@10 15
No. 2 Strong Foundry	9 65@10 00	Gray Forge	9 40@ 9 65
No. 3 Foundry	9 25@ 9 40	Lake Superior Charcoal	12 25@12 50

Continued on page 7

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Sept. 15.

The market is steadily advancing, and quotations on several products were raised last week. The feeling among mill and furnace men is one of entire confidence in the future. Sales are not perceptibly increasing, but this is because the mills and furnaces have taken nearly all the business they can handle for the balance of this year, and are not anxious to make prices at the present time for next year's deliveries. Buyers of most classes of iron and steel are fully aware of the tendency of the market, and are very willing to place contracts for material for as long ahead as sellers will take them. The one exception is pig iron. It seems to be true that a large number of the pig iron consumers in this market have not yet come to the conclusion that this is a good time to buy. Most of these, however, are the smaller consumers. The larger buyers, who are in the market more frequently seem disposed to buy as much iron as they can, for as long deliveries as possible. It is reported here that the Tennessee Coal, Iron & Railroad Co. is fully sold up on pig iron for the balance of this year, and has withdrawn from the market. Several other Southern furnaces are also said to be in nearly the same condition, having very little iron for delivery this year. The Sloss Iron & Steel Co. is reported to be short of several grades. As a consequence there is very little Southern iron to be disposed of in this market in the balance of the year. The local furnaces are nearly as well sold. The mills here are also very well booked, and have very little steel for sale to deliver this year. The Illinois Steel Co.'s president is quoted to the effect that the company's order book is fuller than for a long time at this season of the year. The consumption of iron and steel appears to be increasing all the time, and buyers are as anxious as ever to make contracts.

PIG IRON.—Two advances of 25 cents each have been made in prices by the Southern furnaces in the week, and one by the local furnaces. The demand for iron has kept up notwithstanding these advances, but sales were not quite so large as in the week previous. It is not expected that buying will be very heavy this week, as the higher prices may restrict it. The smaller consumers find it difficult to believe that there actually has been an advance, after all these months of a falling market, and some of them have not been made to believe that there is sufficient occasion for the higher prices to make them permanent. The large buyers, however, have bought a large tonnage in the last two weeks. Some furnaces, both North and South, are reported to have placed all of their product for the balance of this year. Consumption is much larger in this territory than for a long time and appears to be increasing judging from the deliveries of pig iron. Foundries are taking iron faster than they had contracted for, and are buying additional iron to cover new business in excess of anticipations. Quotations have been revised as follows:

Lake Sup. Charcoal	$13 00@13 25	South'n Coke No. 3	$10 25@10 50
Local Coke Fdy. No. 1	11 00@11 50	Southern No. 1 Soft	11 00@11 25
Local Coke Fdy. No. 2	10 50@11 00	Southern No. 2 Soft	10 50@10 75
Local Coke Fdy. No. 3	10 25@10 50	South'n Silveries	10 00@10 75
Local Scotch Fdy. No. 1	11 50@12 00	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	11 00@11 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 50@11 00	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	11 00@11 25	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	10 50@10 75	Coke Bessemer	11 50@12 00

BARS.—Several large contracts were placed last week. Business seems to be improving, and comes from new buyers every day. The car works are still taking good lots of iron, and further orders from this source are expected. General business in small lots is steadily growing larger. Prices are very firm, and are made at 1.10c to 1.15c for common iron; 1.15c to 1.20c for soft steel bars from strictly billet stock; 1.20c to 1.25c for guaranteed iron.

RAILS AND TRACK SUPPLIES.—The local mills report a good demand, in small lots, for both heavy and light sections. It is expected that the demand will continue good to the end of the year, and that the large buying for next year by the principal roads will come earlier than usual this year, possibly beginning by the first of next month. Prices on next year's delivery have not been made yet. The market is very firm. Quotations are made: Rails, $19 to $21, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—Prices advance every week, and sales have been made since our last report at prices at least $1 higher than those of a week ago. Both billets and rods are very scarce in this market, and the demand for both appears to be in excess of the supply. Billets are now quoted at $17.50 to $18, and $24 for rods.

STRUCTURAL MATERIAL.—The Santa Fe contract for 12,000 tons of material was let last week, the steel to be rolled in Pittsburg. A small contract of 600 tons, for a bridge on the Drainage Canal, was also given out. The C. M. & St. P. road has placed contracts for quite a large tonnage for bridge work lately, and has further work in prospect. Other roads are also buying quite a good deal of the same material. New business is good and includes several round lots for various purposes. The Drainage Canal work for the near future will include four large bridges, which will take about 4,000 tons each. The market is very firm, and advances are reported by some of the mills. Open-hearth steel is quoted at higher prices than Bessemer, by about $1 a ton. Quotations are made as follows: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—Sales last week included several very good orders, and the inquiries in hand indicate further large business ahead. The demand is expanding, mills are filling up and are not especially anxious for any but the most desirable business. Advances may be expected soon and in fact have already been made by some mills. We continue our quotations: Tank steel, 1.10c to 1.20c; flange steel, 1.20c to 1.25c; fire-box steel, 1.85c to 5c.

SHEETS.—Both black and galvanized sheets are in large demand, and sales last week included several large orders. Quotations are made at 2c to 2.05c for No. 27 black, and 80 and 5 to 80 and 2½ per cent discount for galvanized.

MERCHANT STEEL.—Business has been large, and orders are more frequent. The demand is not expected to fall off, but on the contrary shows a decided increase every week. Quotations are very firm, and are made as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—There is not a heavy demand, and sales have not been large, while prices are rather stiffer than they were a week ago. Dealers' asking prices for old material are as follows:

Old iron rails, gross	$11 75@$12 00	Axles, net	$13 50@$14 00
Old steel rails, gross	7 @ 7 50	Cast borings, net	2 75
Old wheels, gross	10 00@ 10 25	Wrought turnings, net	4 00@ 4 50
Railroad forge, net	10 50@ 11 00	Axle turnings, net	5 50@ 6 00
Dealer's forge, net	9 00@ 9 50	Mixed steel, gross	6 25
No. 1 mill, net	7 50@ 8 00	Stove plates, net	5 50@ 6 00
Heavy cast, net	7 50@ 7 75	Heavy melting steel gr.	7 00@ 7 50
Malleable cast, net	8 00@ 8 50	Old iron splice b., gr.	11 00@ 11 25

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Sept. 15.

The reported coming into the market of three heavy users of Bessemer pig was effective, late last week, in causing a decided stir in Bessemer, that has advanced prices 50c a ton. The scarcity in gray forge is intensified and after the week's heavy buying little can now be had. Finished material continues strong and in some lines there is more unanimity in holding for advanced prices.

PIG IRON.—With the close of last week came another sudden but decisive jump in Bessemer. The movement is attributed to the buying attitude of the Lorain, Youngstown and New Castle steel interests, whose wants, in part at least, have now been covered. There has since been haste to take advantage of options previously granted and the number of sales has been large, including some of a speculative character. The course of the market is indicated by sales reported at $9.40, $9.55, $9.65, $9.75 and $9.85, valley, the last named being the maximum valley price authenticated. From a Pittsburg furnace 5,000 tons for delivery through January, was sold at $10.15. An even more marked advance was made in gray forge. Two selling furnaces, one in Pittsburg and the Dunbar interest, report sales of upward of 15,000 tons of forge, the price ranging from $8.50, Pittsburg, early in last week, to $9.15, Pittsburg, made on 3,000 tons this week. Both furnaces are now practically out of the market and the available stock of gray forge is very meager. For spot shipment it can scarcely be had. Foundry irons are only stronger in feeling,

the buying tendency being more noticeable in outside foundries than in Pittsburg. Quotations are made as follows:

Bessemer at valley furnace last quarter	$9.75
Bessemer delivered Pittsburg District	10.00 to 10.35
No. 1 Foundry	10.35 to 10.50
No. 2 Foundry	9.75 to 10.00
No. 3 Foundry	9.35 to 9.50
Gray Forge, Valley	8.75 to 8.90
" " Pittsburg	9.00 to 9.25

BILLETS.—Steel made another advance in the week and the upward progress is being stimulated by a growing scarcity of material. The Mingo Junction, New Castle and Bellaire mills will all resume next week but all are said to be sold up for the year. Sales were made in the week at from $15.25 to $15.50 maker's mill. The present quotation is $15.50 Pittsburg maker's mill, with $15.00 to $15.35 ruling in the valley. Rods are quoted from $21.50 to $22.

SHEETS.—The eagerness of galvanizing and corrugating interests for prompt sheets is undiminished, particular demand being made for No. 27 and No. 28. Great difficulty is experienced in getting these gauges, even for late fall delivery. For No. 28, 2.10c has been paid to secure special shipments but 2c is quoted. On No 26, 1.85c is asked and on No. 27, 1.90c. Black plates for tinning are quoted at 2.30c and galvanized sheets at 80 and ten per cent off list.

BARS.—Railroad buying shows signs of broadening and bar iron is in much better demand, especially branded bars. On common iron 1c to 1.05c is ruling. Steel bars were very active during the week, one sale of 2,000 tons being made for eastern delivery. On current business 1c to 1.05c is quoted.

STRUCTURAL MATERIAL.—Bridge work is a large factor in current structural business. The first allotment of material to be used in elevating the tracks of the P., Ft. W. & C. Ry., in Chicago, was taken last week by the Carnegie Steel Co. The Youngstown city bridge will be of the same steel, the contract having been taken last week. Beams and channels are quoted at 1c to 1.10c, depending on order; universal plates and angles, 1.05c; tees and zees, 1.15c to 1.75c. Attractive lots are a law unto themselves and low prices still occur.

PLATES.—Railroad purchases of tank, boiler and fire-box steel are very heavy. Repair work is now an important source of orders and new work likewise is on the increase. Tank, boiler and fire-box requirements for 15 new locomotives came to a local mill late in the week. Open-hearth tank is strong at 1.05c and two leading interests are reported full for a month ahead. On Bessemer tank, 1c to 1.05c is quoted, shell, 1.10c to 1.15c; flange, 1.15c to 1.20c. On tank plates, prices are firm.

RAILROAD AND TRACK SUPPLIES.—Quotations are made as follows: Steel rails, $19 and $20, according to section; iron track bolts, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; splice bars, 1.10c to 1.15c; links and pins, 1.15c to 1.20c.

IRON AND STEEL SKELP.—Skelp mills are not running regularly, and circumstances have combined to advance prices. A sale of 1,000 tons of grooved iron skelp is reported at 1.15c. Quotations are made as follows: Grooved iron skelp, 1.07½ to 1.10c; sheared iron skelp, 1.20c to 1.22½c; grooved steel skelp, 97½c to 1c; sheared steel skelp, 1.07½c to 1.10c.

PIPES AND TUBES.—The 8-inch line pipe requirement of the Forest Oil Co., on which bids have been made was covered early in the week. The contract will probably be for 20 miles and was divided between a Pittsburg mill and the Oil City Tube Works. The order is for Western delivery. Mills are very busy just now on an unusually heavy fall business. Discounts recently agreed upon are maintained as follows: Butt weld, galvanized, 50 per cent off; lap weld, galvanized, 55 per cent off; butt weld, black, 57 per cent off; lap weld, black, 67 per cent off. Steel pipe, 6 tens additional; iron, 5 tens and 5 per cent—both quotations being for carload lots. Discounts on boiler tubes are quoted as agreed: Two and a half inch, 77½ per cent off; two and two and one-quarter inch, 75 per cent off; one and one-third inch, 70 per cent off; one and three-quarters inch, 65 per cent off.

FERRO-MANGANESE.—Domestic ferro-manganese, 80 per cent, is quoted at $45.50 to $46 maker's mill.

OLD MATERIAL.—A Pittsburg broker last week sold 3,500 tons of iron rails in the valley for $13.50. The tonnage consisted of two lots, 3,000 and 500 tons respectively. Another lot of 1,000 tons sold in Pittsburg for $13.25 and iron rails below these prices cannot be had now. Sales of steel rails were made at $9.75 and $10, establishing a higher basis on this material likewise. Wrought scrap of all descriptions is scarce and higher. No. 1 wrought has sold at $11 gross and above. Foundries are taking more cast scrap and are paying $8 to $8.75 gross ton. Car wheels for local delivery are quoted at 9.00 to $9.25.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. Every feature of the pig iron trade has been of an encouraging nature the past week. A few purchases have been made by investors, whose attention has been called to the relatively low price of iron, but most of the tonnage has been placed with consumers. The heavy demand has led to another advance of 25c per ton in Southern brands. One of the largest Birmingham producers has found it necessary to stop selling for this year's delivery for fear that it will be impossible to make iron to fill additional orders. Other companies are contracting with consumers for their legitimate wants to Dec. 31st, at present prices, and there is no appearance of desire on the part of producers to create a boom. They feel that the conditions are favorable for sustaining prices at a somewhat higher level during a long period and they are content to let the market take its natural course. We quote for cash, f. o. b. cars Cincinnati: Southern coke No. 1 foundry, $10; No. 2, $9.50; No. 3, $9.25; Southern coke, gray forge, $9; mottled, $8.75; No. 1 soft, $10; No. 2, soft, $9.50; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson County silvery, No. 1, $12.50 to $13; standard Georgia car wheel, $14.25 to $15.

Buffalo. It was expected by many that a lull would naturally follow the recent sharp buying movement, especially so in view of the general advance in the iron market, but so far, the buying movement has continued, and a still further advance of 25 cents per ton has been ordered in Southern iron. Local furnaces report having booked heavy tonnage, and are much stiffer in price than for some time past. We revise our quotations to the basis mentioned below, cash f. o. b. cars Buffalo: No. 1 foundry, strong, coke iron, Lake Superior ore, $10.50 to $10.75; No. 2 foundry, strong coke iron, Lake Superior ore, $10 to $10.25; Ohio strong softener, No. 1, $10.75 to $10.90; No. 2, $10.25 to $10.40; Jackson County silvery, No. 1, $14; Southern soft, No. 1, $11.60; No. 2, $11.10.

Philadelphia The outlook has shown further improvement in the week and is increasingly cheerful. There has been a good deal of advancing prices on paper lately and a stock jobbing flavor has been given some of the publications by the evidence of an organized effort to push up the stock of one large producer of pig iron. The continued reductions of pig iron stocks simultaneously with increasing production give some clew to the attitude of consumers and the absence of any considerable stocks in their hands. The advances in price of pig iron are conceded more readily now. While considerable sales were made in this market previous to last week at $10.50 for No. 2 plain and $10.75 for No. 2X, Southern iron, holders are quite firm at a further advance of 25 cents for ordinary brands. Where furnaces have been holding up deliveries at the request of buyers, the latter are now ordering forward the iron, and all reports from consuming interests confirm what the statistics tell of the growth of consumption. As for several weeks, steel leads pig iron in strength and the advance in billets is easily $1.75 from the lowest point. The price is maintained to-day at $17.75 and sellers have only limited amounts of billets for delivery this year. The finished material market has shown no large deals in the week but there is a steady run of small orders, for a diversity of needs, from widely scattered sources. No further advances have been made, but in general the firmer prices of the past three or four weeks obtain, and in plates and structural material further advances are predicted. Nearly all plants actively in operation are making full time.

IT is reported that the naval armor plate commission is surprised at the great outlay which the Government would be required to make if it would undertake to manufacture its own armor plate.

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THE COAL STRIKE SETTLEMENT.

The strike of the bituminous coal miners has ended at last in acceptance, by a very close vote, of the 65-cent offer of the operators of the Pittsburg district. The greatest marvel is that with the operator's offer only four cents below the demand of the men, so many of the latter should have voted to continue indefinitely the struggle, in the face of the suffering and well-nigh starvation so general among the families of the miners. If starvation has been near to the miners even when employed, at the wages previously paid,—and there is little doubt of the deplorable state to which many of them have come—it is amazing that after 10 weeks of idleness, any should be found willing to go on with the fight to the bitter end.

The effort at settlement has brought out a condition not without precedent in labor organizations—a determined opposition to the recommendations of the leaders of the union. Though the executive board was a unit in recommending the acceptance of the 65 cent rate for the balance of the year, leaving next year's basis open for adjustment after Jan. 1, it required three days of argument and conference to secure a bare majority in support of the men who have borne the brunt of the struggle. It will be recalled that the conservatism of the officers of the Knights of Labor, in their efforts to adjust critical differences, made them the objects of suspicion and bitter reproaches by those for whom they were contesting every inch of ground. It is the radicalism of the rank and file that will not brook admonition from cool-headed and long-tried leaders, that is one ground of complaint against the unionism of to-day.

Another fact emphasized in the Columbus settlement is that a national scheme of organization and of wage adjustment for the bituminous coal industry is out of the question. There is good ground for the charge that much of the opposition to a settlement was instigated by sections whose interests would be furthered by prolonging the strike so that the least possible amount of coal might be sent by water to the Northwest in the present season of navigation. In Ohio, political considerations were a factor. Thus mercenary and political reasons led many miners to vote to keep the families of their fellow members in starvation and half nakedness. How does this comport with the claim that the interests of all sections are conserved by a national organization? It is a strange commentary on the policy adopted in the strike of 1894, for example. In that year, operators from several important districts spent two or three days in conference with the union officials, only to be told by the latter at the end of the sessions, which were fruitless, that in no event could anything have come of them, because of the absence of other operators, who, it was known when the conference was called, would not be present. To be sure, there is an appearance of conserving the interests of all the districts, in the 10-day clause attached to the settlement just ratified. But this is already inoperative, several Pittsburg district mines having started up.

The effect of the resumption of mining will be felt promptly in the iron industry. At many mills operations have been carried on in a restricted way because fuel could not be had. Bar and puddling mills, in particular, have been hindered. Orders have accumulated on their books, and where fuel could be had it was at a price that still further reduced the meager profit allowed by the majority of time contracts now in the hands of the mills.

From the standpoint of industry in general the settlement of the strike is cause for congratulation. Practically only six weeks of lake traffic will be left, and in that time lower lake railroad and dock facilities will be taxed to their utmost. The improved machinery for loading coal and the better facilities at upper lake docks for getting it out of the boats will permit of handling a very much larger tonnage than would have been possible in any other season, but it is still thought that the full movement of coal by lake cannot be attained. In order to equal last year's shipments to Lake Superior ports (the Sault passages making the figures to Lake Superior alone available), it will be necessary to send up 1,600,000 net tons of coal in the balance of the present season, only about 1,000,000 tons having been shipped when the strike began. This takes no account of Lake Michigan business.

We do not look to see the end of the coal miners' troubles with this year or another year. The industry is plainly overdone. There are too many mines opened up and too many miners. It sounds heartless to say to the miners that the only hope for permanently better wages lies in at least a third of them getting into other business. But such is the fact. Better prices for coal and better wages for miners can be maintained only when we have come to a better adjustment of supply to demand. District rivalry; unstable differentials, that it seems hopeless to expect to get on a stable basis; the vast quantities of coal that will be mined in the strife of railroads and of mine-owners to get the largest share of going business and reduce the cost unit to the minimum—these are a few of the considerations that make the maintenance of peace and prosperity

in the coal trade the most difficult practical problem in all industry to-day.

Some of the recent publications concerning the iron market, particularly those emanating from Eastern sources, have evidently filtered through stock brokers' offices. The fact that Tennessee Coal, Iron & Railroad Co. stock, from having been as low as 21½ in July has reached 34¼, while there is a well organized effort, apparently, to carry it several points higher, gives a suggestion as to the reasons for some of the publications of the past three weeks. The situation in all stocks is inherently strong, and the few listed iron and steel stocks naturally participate in the upward movement. Illinois steel, from being 33¼ at the low point in July went to 50 at the end of August. Colorado Fuel & Iron, that touched 16¾ in July, has since gone to 22. There are good reasons for advances in every iron stock, but there is need to discriminate between legitimate news of the iron trade and that which has the earmarks of outside interests, to whom a boom has no terrors and whose gains are generally greatest when unhealthy conditions have been produced.

THE CLEVELAND DISTRICT.—Continued from Page 3.

Billets and Rods. An inquiry for several hundred tons of ingots and blooms has come up in the local market, and a deal for 5,000 tons of sheet bars is pending. The billet market is firm, with Cleveland quotations ranging from $15 to $15.50, the market strengthening in sympathy with Pittsburg, where the largest company is reported to have been a buyer of steel in the week. Rods are quoted $21.50 to $22, but the tonnage of prompt rods appears to be chiefly in the hands of a Pittsburg interest. The Cleveland Rolling Mill Co. has made a sale through New York, of 1,000 tons of wire rods for export.

Finished Material. All the lines of mill products have held the advances heretofore noted, and some show added firmness. A 6,000-ton rail contract has just been closed in this market for shipment abroad. An inquiry for 1,000 tons of steel bars is up, and bar iron is somewhat more active at 1c to 1.05c, Cleveland. Sheets, particularly for corrugating purposes, are in good demand and at firmer prices. We quote 2c for No. 27 in ordinary lots. There are further rumors of prospective vessel work, but no definite announcements as yet. The activity of valley mills has made a better demand at higher prices for old material. Old iron rails are quoted $14; old steel rails, $10.50; No. 1 wrought scrap, $11.50; old car wheels, $11; mill scrap, $8.50, with a tendency to higher prices.

Foundrymen's Convention at Cincinnati.

Under date of Sept. 5, A. Sorge, Jr., secretary of the Western Foundrymen's Association, 1020 Monadnock Blk., Chicago, has sent out the following notice of the October meeting of the association: "The fall meeting of the Western Foundrymen's Association will be held in Cincinnati, beginning Oct. 18, 1897, and will last two or three days. It is proposed to make this an interesting meeting by the reading and discussion of important papers, by visits to establishments of national reputation in and near Cincinnati, and by bringing the foundrymen together for several days in social intercourse. The cordial invitation extended to the Western Foundrymen's Association by the foundrymen and allied interests of Cincinnati insures a very enjoyable time to all attending. Reduced railroad rates will be made from Chicago. Also special hotel rates at Cincinnati. If a sufficient number of ladies will accompany the party, a ladies' committee of entertainment will look after their comfort. The above is only an outline and the program of the meeting will be sent you later on. Prepare now for this event, which will be the most enjoyable ever participated in by this association, and to which you are cordially invited."

Sudden Cooling of Nearly Pure Iron.—[*Engineering*, July 9.]—Prof. Arnold in discussing the influence of sudden cooling on nearly pure iron attacks the allotropic theory of iron advanced by Prof. Howe, and shows that the experiments on which it is based, admittedly erroneous to some extent, would not justify the conclusions drawn from them. This allotropic theory briefly stated claims that when nearly pure carbonless iron is heated to about 1,600 degrees F., it assumes an allotropic form possessing a tenacity far greater than ordinary iron, and this property is nearly all retained when the metal is suddenly quenched. Prof. Arnold goes on to give the methods of Prof. Howe for obtaining data on which he based his theory, and points out what he thinks is a weakness in the chain of reasoning. He finds that the break at a point in the curve of recalescence of a steel was not proved to be accompanied by a corresponding break in the curve based on the physical strength and the various quenching temperatures. This Prof. Arnold considers the crucial test of the whole theory, and to examine the point he melts Swedish bar iron in a crucible, casts a 50-lb. ingot which was then hammered and rolled to a five-eighths inch round rod. From this the test pieces were prepared. The material when analyzed had but 0.22 per cent impurities, of which carbon was 0.07. The test pieces had a cross section of 0.1 square inch, had both ends recessed, one for the reception of a thermocouple of the Le Chatelier pyrometer, and the other for the introduction of the holding bar, which enabled the operator to rapidly quench the test piece when the desired temperature was reached. All bars were heated to 1,800 degrees F., allowed to cool to the desired temperature, being then at once plunged into iced brine. The heating and cooling was conducted in an atmosphere of pure nitrogen, preventing all scaling of the metal, and leaving it almost as well polished after quenching as it was before heating. Tensile tests were now made and curves constructed which seemed to warrant the conclusion that "the increasing tenacity as the temperature of quenching runs up is a measure of crystalline stresses, internal and external. When these stresses are counterbalanced by the flow of metal preceding rupture, the mass resumes its normal ductility as measured by the reduction in area." Prof. Arnold would then seem to conclude that there is nothing in the theory of an allotropic state of iron, but that the phenomena observed are entirely of a nature compatible with a single state of existence of the element iron. M.

Col. A. B. Pope, recently interviewed on his return from Europe, said that he found the bicycle trade on the other side thoroughly demoralized as here, because of too many in the business with small capital and lack of facilities. He predicted a reduction in the number of manufacturers and better business for those who survive. The chainless wheel, which will be out next year, will be costly, he said, because of the perfection demanded in the adjustment of parts, so as to minimize friction. It will be too dear for the average rider to buy and therefore the chain wheel will not go out of date.

The great wheel at Earlscourt, Eng., the idea of which was appropriated from the Ferris wheel at the World's Fair, has proved a pronounced financial success. The company celebrated the carrying of its millionth passenger a few days ago and in celebration thereof declared a special quarterly dividend of seven and a half per cent.

Stocks in pig iron storage warrant yards are increasing steadily. The American Pig Iron Storage Warrant Co. put in yard in the first ten days of September 11,700 tons. In the same period a total of 3,800 tons was withdrawn, leaving in yard Sept. 10, 258,200 tons, the largest total on record.

If the attendance at the Tennessee Centennial keeps up as the managers now count on, the exposition company will be able to pay back the subscribed stock and possibly a small dividend—a record unparalleled in exposition finances.

IRON ORE PRODUCTION IN 1896.

Mr. John Birkinbine, the well-known iron ore expert, has been in Cleveland within the week, on his return from a trip to the Lake Superior region. Through his courtesy we have had the opportunity to peruse the advance proofs in his possession, of the iron ore monograph which he contributes to the Mineral Resources (or Part V.), portion of the 1896 report of the United States Geological Survey. From its interesting statistical data we have taken the following:

While the business depression was severely felt in the iron-ore-mining industry in 1896 and there were fewer producing mines than in former years, the total output was above the average. Twenty-three States contributed to the production of 16,005,449 long tons, exceeded only in 1892, when the maximum, 16,296,666 tons was reached, and in 1890, when the total was 16,036,043. The record of 1895, with its 15,957,614 tons, was not far behind 1896, and the two years stand out in strong contrast with the deep depression that gave a total of but 11,587,629 tons in 1893 and 11,879,679 tons in 1894.

Red hematite ores contributed 12,576,288 long tons in 1896, brown hematite 2,126,212 tons, magnetite 1,211,526 tons, carbonate 91,423 tons, all showing an increase over 1895 except magnetites, which fell off 57,000 tons. The relation between the total output of ore in the United States in recent years and that from the Lake Superior region appears in the following, all in long tons:

	United States.	Lake Superior.	Per Cent.
1892	16,296,666	9,564,388	58.7
1893	11,587,629	6,594,620	56.9
1894	11,879,679	7,682,548	64.7
1895	15,957,614	10,268,978	64.3
1896	16,005,449	10,566,359	66

It will be noticed that the Lake Superior output has increased in the past three years, in relation to the total; and as heretofore noted in these columns the Lake Superior production in the years 1895 and 1896 went far beyond the average of the several years preceding. The figures above differ from those annually collected by *The Iron Trade Review* for the reason that the latter represent ore shipped while the former stand for ore mined.

The production by ranges in 1896, with percentages, was as follows:

	Long tons.	Per cent.
Messabi	3,082,973	29.18
Marquette	2,418,846	22.89
Gogebic	2,100,398	19.88
Menominee	1,763,235	16.68
Vermilion	1,200,907	11.37
	10,566,359	100.00

In commenting on the method adopted by the producers of old-range Bessemer ores for the exact calculation of values, as determined by iron and phosphorus content, the report says: "The equation of selling prices of ores upon the difference of 0.001 of one per cent of phosphorus, or 0.35 ounce in a long ton of ore seems to be reducing this subject to a fine art, and great nicety of determination will be necessary to have the analyses of an ore by two chemists agree. It must be borne in mind that the system of valuing iron ore is constantly changing and the method above is given merely as an illustration to show the great care which is taken to arrive at a correct and equitable scale of prices."

On the question of royalties, Mr. Birkinbine says:

"While it is not the province of this report to discuss the cost of winning ore at individual mines nor the average cost on each of the ranges, one feature which influences the relative expense of producing iron ore may be mentioned in addition to the transportation distances noted in the report of 1895. This feature is the royalty paid by lessees to owners of property for each ton of iron ore taken out, an annual minimum amount being demanded in most cases. In Minnesota some of the important mines are owned in fee, but a majority of those now wrought pay from 20 to 30 cents per ton royalty, and in some instances subroyalties increase this to as much as 50 cents per ton. Mines located on lands owned by the State pay a royalty of 25 cents per ton of ore taken out, but late legislation, with the object of encouraging industries, remits this royalty on ore taken from mines on State lands and smelted in the State. No ore is now smelted in Minnesota, but there is a blast furnace plant ready to be operated. In the older ranges of Michigan the proportion of fee properties is greater than in Minnesota, but a number are wrought under royalty. Most of the royalties in force have been modified in later years, the average royalty now paid at some of the mines being based on a sliding scale, approximating six per cent of the market value of the ore at lower lake ports."

In the discussion of the production of ore in the various States, this very fair statement appears, relative to the positions of the new and the old ranges: "The general depression in the iron trade and the increasing output of the operations on the Mesabi range in Minnesota influenced the restriction of production on the older ranges of the Lake Superior region, but this restriction has not verified the prophecies of those who proclaimed the early abandonment of important producers. The record of 1896 would rather suggest continued active competition between some of the older mines in Michigan and the later developments in Minnesota. Shorter rail and lake transportation from and ownership of property of Michigan mines offset in part the apparently cheap mining costs of exploitations on the Mesabi range of Minnesota."

The total iron ore production of the United States in 1896, viz., 16,005,449 long tons, was valued at $22,788,063 at the mines, or $1.42 per ton. This was an increase on the average value per ton in 1895 ($1.14) of 28 cents per ton, or 24.56 per cent. The highest recorded average value per ton was in Missouri, where but a comparatively small amount of rich red hematite and a small quota of brown hematite used as a flux in the smelters gave an average of $2.82. Colorado came second, the average value of the 215,819 tons being $2.43 per ton, the price being enhanced by the percentage of manganese and silver carried by some of the ores, which were used as fluxes in smelting the precious metals.

The Lake Superior region also shows a decided advance in value in 1896, the average value of the product of Michigan being $1.78, of Minesota $1.23, and of Wisconsin $1.76, against $1.45, $0.73, and $0.86, respectively, in 1895. The breaking of the pool formed to control prices in the early part of 1897 subsequently caused a decided decline in selling prices as compared with 1896. The following table gives the total and average value of iron ore at the mines, together with the production for each State, and it should be borne in mind that these do not include transportation charges, which will account for the seemingly lower value of richer ores that are farther removed from the market as compared with other leaner but more accessible ores. These values represent the estimate for the ore when ready to be shipped from the mines:

Production and valuation of iron ores in 1896, by States.

State.	Production. Long tons.	Total valuation at mines.	Value per ton.
Michigan	5,705,736	$10,143,918	$1.78
Minnesota	4,283,880	5,286,664	1.23
Alabama	2,441,793	1,417,451	.69
Virginia	859,466	1,220,619	1.42
Pennsylvania	747,784	910,916	1.23
Wisconsin	607,405	1,071,511	1.76
Tennessee	535,484	432,932	.81
New York	385,477	780,932	2.03
New Jersey	264,999	528,759	2.00
Colorado	215,819	524,915	2.43
Georgia and North Carolina	175,331	150,018	.85
Ohio	58,480	72,019	1.23
Montana, New Mexico, Utah, and Wyoming	44,596	96,486	2.16
Kentucky	30,096	38,256	1.27
Connecticut and Massachusetts	27,289	63,286	2.32
Maryland	11,502	23,004	2.00
Texas	4,777	3,583	.75
Missouri	4,535	12,800	2.82
Total	16,005,449	22,788,069	1.42

With the exception of 70,739 long tons of magnetite, all the ores won from the Lake Superior mines are classed in the report as red hematite. The total for the country includes also iron ores which carry manganese, varying from 3.1 to 35.05 per cent, amounting to 726,413 long tons.

In addition to those made in the rod mill, the nail mill of the New Castle Wire Nail Co. has undergone a number of improvements which will materially increase the tonnage. New reels of larger capacity have been put in. The rod mill started up Sept. 9, but the striking wire drawers are still out.

The following is the production of minerals as reported to Dr. Eugene A. Smith, State Geologist, and secretary of the Alabama Industrial and Scientific Society, for the month of July, 1897: Coal, 509,396 tons; coke, 99,688 tons; pig iron, 70,191 tons; iron ore, 438,990 tons; building stone, 4,560 tons; limestone for flux, 154,567 tons; bauxite, 760 tons; total number of employes, 12,905.

LUNKENHEIMER INJECTORS.

Illustrations are given of three injectors manufactured by the Lunkenheimer Co., Cincinnati, each having an adaptation to special service. Fig. 1 gives a sectional view of an automatic single tube boiler injector, designed to meet the severe requirements of modern locomotive, marine and power plant practice. It will start with 25 pounds steam pressure and work steadily up to 225 pounds and above, regardless of variations of steam pressure or water supply.

Should the water supply be interrupted from any cause whatever, it will stop forcing until the supply is resumed, when it will take up its work without any attention from the operator. This feature commends the injector for railroad and marine use, as in such service, conditions are constantly met where the water supply is irregular, owing to low water in tanks and such bodies of water being disturbed, causing it

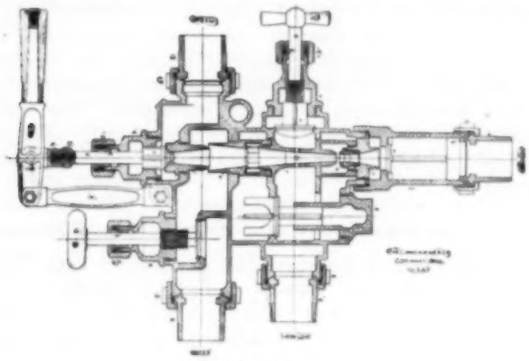

FIG. 1.

to leave the end of the suction pipe uncovered. The Lunkenheimer automatic injector will not blow into the suction pipe when it breaks, but into the atmosphere, thus creating a strong draft through the injector, so that when the water comes back to the end of the suction pipe it will come up to the injector, which will at once start to work and force it into the boiler. This injector will start promptly at all times no matter how hot it or the suction pipe may be, due to using it as a heater, and in starting it is not necessary to prime the machine, as it will start instantly without any appreciable loss of steam or water at overflow. The interior construction is simple, the

FIG. 2.

FIG. 3.

parts are large and well designed, and there is no delicate mechanism to be wearing out and giving trouble. There are but 24 pieces. Repairs are not often required, as the metal of which the tubes are made is of the best quality. The tubes can be easily replaced when worn and no special tools are required for the operation. The tube which wears the most of all is the last or delivery tube, which is made detachable.

The capacity is regulated by reducing or increasing the water supply with the regulating valve. This method enables the capacity to be reduced fully 50 per cent, and the injector will work as steadily when running with minimum as when discharging its maximum capacity. This injector can be used to wash and test boilers, and in testing several times the initial pressure can be applied. Twelve sizes are manufactured, varying from 400 to 6,000 gallons capacity per hour at 125 pounds of steam.

Fig. 2 is the "Emerald" boiler oil injector, especially designed for locomotives, but suitable also for stationary and traction engine boilers. The cup has the "bull's-eye" sight-feed. When a glass breaks, the entire "bull's eye" can be replaced by using a monkey wrench. On stationary boilers the cup is attached to the feed water pipe close to the pump. After attaching, the main stop valve D and the oil regulating valve C are closed and the cup filled with boiled oil. The valve D is closed slowly and the flow of oil regulated with C. When the cup requires refilling, the valves D and C are closed, the water is drained from the cup at F, then again the cup is filled with boiler oil.

Fig 3 illustrates the "Standard" boiler oil injector, designed to be attached to the feedwater pipe of steam boilers to feed oil into the boiler for the prevention of scale, of foaming, pitting and leaky joints. Tests have shown that a scale 1-32 of an inch requires nine per cent more fuel; a scale 1-16 of an inch 12 per cent; a scale one-eighth of an inch 30 per cent, and a scale one-quarter of an inch 60 per cent, and as the scale thickens the ratio increases. The "Standard" injector has but one connection to the feed pipe. It feeds visibly drop by drop.

THE TIN PLATE MARKET.

The general firmness and advancing tendency of the steel market has been reflected, though in a smaller degree, in tin plates, and the market to-day is much firmer in tone than at any time during the past four months. Recent trading has been rather unsatisfactory and the volume of business has been smaller, but the mills generally report a full order book for deliveries through the balance of the year and there is comparatively little anxiety shown to sell futures beyond January at prices now prevailing.

It is to be noted that the prices at which 1898 business has been done within the last six weeks are the lowest ever made in the history of this article, and these low prices following the advance in wages granted by the makers in July has had a tendency to unsettle the market and has given many of the large buyers the impression that the selling price of tin plate does not depend upon labor cost, or upon the steel market, but upon the caprice of a few individual makers and that the profits in the manufacture are so large at the present prices that the advanced price for steel and labor will not necessarily mean high priced tin plates.

The scarcity in spot plates, previously mentioned, has continued during the past month and the fortunate holders of desirable sizes have been able to command very good figures, and sales are reported on a basis of $3.35 to $3.50 for 14x20, 100-lb. plates, immediate shipment out of stock. It is needless to say that these prices are only paid on emergency orders, and now that the canning season is drawing to a close, it seems probable that present stocks will amply supply current demand.

Makers all find much difficulty in securing tin plate bars. Some works have been closed down and nearly all the works are behind on their deliveries and assign the difficulty in getting steel as the cause. Steel makers are asking from $1 to $1.50 per ton advance over former quotations, and this fact alone will probably cause considerable strengthening of the tin plate market. We quote for deliveries January to June, 1898, as follows, f. o. b. maker's mill, Pittsburg, or Indiana district:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$3.60	$4.35
Calland Grade,	3.80	4.55

COKE TINS.

IC, 108 lb. Basis weight,	$3.15
100 lb. " "	3.05
95 lb. " "	3.00
90 lb. " "	2.95
85 lb. " "	2.90
80 lb. " "	2.85

TERNE PLATES.

IC, 216 lb., 20 x 28	$6.05
200 lb. "	5.75

From 10c to 15c concession is made from these prices for Oct. 1 to January 1 deliveries.

THE Treasury Department publishes statistics showing that British vessels are carrying over 55 per cent of the merchandise of the United States, both imports and exports.

PERSONAL.

Archer Brown, of Rogers, Brown & Co., has sailed for Europe, to be gone three months.

Per Larsson, formerly superintendent of the Aragon mine at Norway, Mich., will remain in Sweden for some time and his family will join him there in October.

Chas. F. Quincy, treasurer of the Q. & C. Co., and vice-president of the National Association of Manufacturers for Illinois, has received the appointment of honorary commissioner of Illinois from the Trans-Mississippi and International Exposition. He has also been elected director in the Iowa Central Railroad Co.

Theodore Foss, Jr., son of the manager of the Sormovo Works, at Nijni-Novgorod, near St. Petersburg, is in this country collecting information in regard to our processes and machinery, especially as relates to tin plate making. The Sormovo works contemplate adding a tin plate works to their already very extensive plant. The undertaking will have to contend with very expensive steel, the domestic steel costing almost as much as the imported, on which there is a duty of about $40 a ton, while the duty on tin plate is about the same. Mr. Foss has visited a number of tin plate works in this country and will visit others before he leaves. He states that there is at present a works making tin plate in Russia by dipping Welsh black plate. For roofing purposes heavy sheet iron and galvanized iron, which are made in Russia, have the preference.—[Tin and Terne.

John S. Thurman, of Indianapolis, patentee of the Thurman fuel oil burner system, has been appointed mechanical engineer of the Missouri Pacific and St. Louis, Iron Mountain & Southern Railway companies, with headquarters at St. Louis.

Benjamin Brewster, of New York, who died at his summer home in Cazenovia, N. Y., Sept. 4, aged 69 years, was a director of the Minnesota Iron Co., and first vice-president of the Chicago, Rock Island & Pacific Railway. Graduating from Yale College, he went, in 1849, to California, where he was engaged in active business for 25 years. In 1874 he returned to the East and was associated with John D. Rockefeller in the establishment of the Standard Oil Co., and was also identified with the construction of the elevated railway system in New York. At the time of his death he was president of the Keokuk & Des Moines Railroad, and was a director of the American Museum of Natural History and the American Geographical Society.

J. W. Duntley, president of the Chicago Pneumatic Tool Co,, Monadnock Blk., Chicago, has just returned from a very successful business trip to Europe. He has been gone for four months, and in that time has visited nearly every European country. The pneumatic tools made by the company are now in extensive use abroad, and foreign shipments are increasing all the time. While in Europe, Mr. Duntley made arrangements with a European company to handle his tools. It is expected that this arrangement will increase the foreign sales very considerably.

Lake Superior Iron Mines.

Reports from all upper lake shipping ports to the ore dealers' association of Cleveland show a total ore movement to Sept. 1 of 7,712,158 gross tons.

In connection with the working, by the Oliver Mining Co., of the Ohio property, which adjoins the Lone Jack on the south, it is stated that the Lone Jack, which has been worked steadily for three years, has gone pretty well to the end of its best ore. The Ohio is so stripped that it can be advantageously mined in connection with the Oliver and Lone Jack.

At the Etna (formerly Lowmore) mine, the Thomas Furnace Co. has let a contract for the removal of 50,000 yards of stripping at once, and 100 men will be put to work as soon as they can be secured. The mine is part of the Mountain Iron deposit, and is easily mined by a steam shovel. It will be extensively worked next season.

The Biwabik Bessemer Co. has let an additional stripping contract to the Drake-Stratton Co. and another shovel is being put to work. It will be continued well into the winter with a large force. The pay of men working for the mining company has been advanced from $1.40 to $1.50 per day.

Latest ore-carrying records are those of the Empire City and the Andrew Carnegie, both of which have exceeded 6,000 net tons. The Empire City took 6,296 net tons or 5,622 gross tons on her first trip out of Two Harbors, being 21 net tons more ore than ever carried in a single cargo on the lakes. The Andrew Carnegie's cargo was 5,425 gross tons or 6,076 net tons, Two Harbors to Cleveland, draft 17 feet four inches. Two recent Ashland records were 5,427 gross tons by the Crescent City and 5,442 gross tons by the Queen City.

Aluminum Production and Market.

The consumption of aluminum in the United States in 1896 amounted to between 600 and 700 tons. An English exchange says of the recent contract of the Pittsburg Reduction Co. to supply 250 tons a year to English firms, in the next four years, that aluminum manufacture is a lucrative monoply. Its use has extended abroad more rapidly than in this country and therefore English manufacturers are unable to supply the demand. It is reported that an agreement has been reached between the English, American, French and Swiss producers, and though the English company has secured favorable decisions in recent litigation, it has arranged to buy a certain proportion of the American output. The duty on aluminum in this country is 10 cents a pound. It is quoted in New York at 37 cents and sells in England at 30 cents a pound.

Unique Operations of a Historic BlastFurnace.

The agricultural operations that are in some cases a prominent feature of the business of furnace companies in the Hanging Rock district of Ohio, furnish a unique contribution to iron trade literature. For example, a recent statement in a local paper, concerning Pine Grove Furnace, near Ironton, O., notes that A. R. McIntosh, the furnace manager, is also head of a farmer's club, the latter being composed of the furnace company's land-renters. Mr. McIntosh, besides looking after the mining of native ore and limestone used in the furnace, devotes a day each month to these gatherings for the improvement of the company's agricultural interests. It sounds queer to be told that in addition to working about 70 miners and getting out from 700 to 800 tons of ore and 300 to 500 tons of limestone a month, the furnace company raised on its own land this year, 1,156 bushels of wheat, 580 bushels of oats, 100 tons of hay, with 60 acres in corn and several acres in potatoes, while a census is also given of the cattle, sheep and lambs, with details of the yield of wool, etc.

The Pine Grove Furnace is operated by Means, Kyle & Co. It is a 34x11 foot stack, open top, making hot blast charcoal iron. Its annual output is estimated at 5,000 tons. The furnace was built in 1827 and rebuilt in 1844. A great oak tree close by, with branches making a spread of 70 feet, is pointed out as the tree to which Robert Hamilton hitched his horse when he located the furnace 70 years ago.

A SUIT has been filed in common pleas court at Cincinnati, by Henry M. Warren, against the estate of Matthew Addy, and against Charles H. Domhoff, asking judgment for $50,000. The petition sets forth that prior to 1887, Matthew Addy, C. H. Domhoff and Henry. M Warren, constituted the firm of Matthew Addy & Co., and that by the terms of the contract agreement Addy and the plaintiff were each to receive 40 per cent and Domhoff 20 per cent of the profits. The firm did a large business. It was dissolved Feb. 1, 1887, the defendant retiring. Warren claims that at this time settlement was made on a basis of a statement of the business which was presented and supposed to be correct, furnished by Addy and Domhoff. They, it is claimed, had exclusive possession, and control of the books of the firm and caused all entries to be made thereon. The money he received in the dissolution settlement he supposed to be his rightful share, relying entirely upon their statement, and he gave a joint receipt and dissolution agreement. Now Mr. Warren claims that in the past 12 months —or since the death of Mr. Addy—he has made the discovery that the statement furnished him was incorrect and fraudulent; that it did not represent the true amount of business done by the firm and that he was defrauded in the dissolution settlement. Mr. Domhoff, in a newspaper interview, says the claim is a matter of news to him; that he does not owe Mr. Warren anything, so far as he knows, the latter retiring from the firm perfectly satisfied.

CONDENSED FROM THE TECHNICAL PRESS.

Why Rails Break in Track.—*The American Engineer, Car-Builder, and Railroad Journal* for September has an article on the above subject, which opens up with a discussion of the broken St. Neats rail on the Great Northern Railway in England. It states that the microscopic flaws found in this rail are occasionally met with in rails of both high and low carbon before they are put into service. It occurs to the reviewer that as many rails fail at once when used, possibly there is some connection, not yet made clear, between these cracks in new rails and their immediate failure. The article gives as the usual American practice a 0.45 carbon steel for light sections, and 0.55 to 0.65 for the heavy modern rail. The modern 0.60 carbon rail has an elastic limit of 55,000 to 65,000 lbs., an ultimate breaking strength of 125,000—130,000 lbs., per square inch, and an elongation on drop test of 14-18 per cent. The 0.45 carbon common rail has only 35,000—45,000 lbs. elastic limit, 80,000—110,000 lbs. ultimate, and 3-12 per cent elongation on drop test. This drop test elongation is obtained by the following method of testing: Rail butts, which would be scrap steel, anyhow, are placed on two rigid supports three feet apart (about two tie spaces) sometimes head up, sometimes side up, and equi-distant punch marks are placed on the maximum flexion fibre. A weight is now allowed to drop freely from a 20-foot height, and the elongation noted. A number of data are given regarding this test, also Mr. Dudley's formula for the tensile strength likely to be developed in a rail of given composition. On the mechanical treatment of rails while making, the following is given: Cool rolling hardens the rail, hot rolling makes it soft and liable to warp while on the cooling bed, while blue cold rolling increases its strength and hardness, but puts it in bad wearing shape. The top of the rail should conform to the wearing surface of the tire, otherwise the metal will flow, and the head should not be too thick. The article calls attention to the desirability of a close inspection by a steel specialist, and afterwards a continued lookout for dents in the flanges of the rail, which should be at once counteracted by placing a tie beneath the spot and spiking it well, as the rail is certain to give way there sooner or later. These dents are liable to occur at any time owing to carelessness in handling the rails while unloading or in spiking them down. The question of fatigue in rails and the modern tendency to rush the mills and thus make them produce inferior material is dwelt upon, also the effect of hammer blows on the part of the locomotive drivers, etc. Rail joints are spoken of, and Mr. Dudley's work commented upon. One statement would, however, appear incorrect to the reviewer, for when it is said that "because rails break from below upwards, therefore the microscopic cracks noted by Mr. Andrews probably have no bearing on the subject," it runs directly contrary to Mr. Stead's and Prof. Ledebur's investigations which show that when a blow is directed upon the under side of a rail, the cracks in the upper face are the starting points of the break, and that therefore microscopic flaws, at least when on the surface of the rail head, seem to have everything to do with the subject. The article concludes with the following service demands for a good rail: The working stress shall not exceed one-fifth the elastic limit. It must be tough enough not to break with the deflection incident to a poor track, and rigid enough to distribute all shocks or vibrations over several ties instead of one. Internal stresses due to cold rolling, unequal cooling, cold bending, or local heating should be absent. No dents, flaws, or signs of bad usage should be noticeable. Finally, eternal vigilance, the occasional record of the dynagraph car, and the plentiful use of brains in manufacturing the rails, as well as in inspecting and maintaining them, should be accorded. M.

Manufacture of Bricks from Blast Furnace Slag.—[*Dingler's Polyteck. Journal*, July 16.]—In a review of an article in *Stahl und Eisen* a method of making bricks from blast furnace slag is discussed. Slag containing much lime and only a little magnesia disintegrates to a fine powder when left to cool in the air. If, however, while in the melted state, it is subjected to the action of a stream of cold water, a hard sharp sand is obtained which has an altogether different behavior. The process is carried out by quenching the slag as it leaves the blast furnace, special care being taken to let the stream run very broad and with an inclination which experience shows to be best. A stream of water is directed in such a manner that the sand formed may remain in scattered heaps. This material is now lifted out of the water by means of perforated baskets and sent to the brick-yard. Here it is mixed with the proper quantity of milk of lime and thoroughly stirred by machinery. The mixture is molded into bricks under some pressure and set to dry for eight days or so, according to the humidity of the atmosphere. About 1,000 of these bricks can be made an hour in this manner, and the hardening is caused by the reaction between lime and the silica of the slag, in addition to the absorption of carbonic acid from the air. Dark slags are said to be inferior for brick making purposes, the lighter grades being preferred. They are said to require more lime than the light slags, must remain mixed up 24 hours longer before they can be molded properly, and finally cannot be transported for three months on account of the chemical reactions taking place more slowly in them. M.

Hardened Plates and Broken Projectiles.—[*Engineering*, Aug. 13.]—In this number of *Engineering*, Mons. L. Bertin completes his review of a series of tests with armor plates and hardened projectiles. M. Bertin takes the tables prepared by Mr. Ellis, which catalogue 108 projectiles fired against 30 Harveyized plates, and subjects them to a very critical anlaysis. He finds that of the 108 shots fired, 68 were such that their value as far as penetration is concerned could be calculated exactly. These results give the Harveyized plates an increase of over 50 per cent above the resistance of the regular type of armor plate. Of these 68 shots, 49 resulted in broken projectiles, and the other 19 gave complete penetration. The author works out constants for the various conditions for application in his formula to obtain the required thickness of plates to resist projectiles, and finds that as the resistance of the material used increases, the decrease in thickness is more rapid than the increase of velocities of the projectiles. A series of very interesting tables is now given to cover this point, as well as to show the effects on hardened and on non-hardened plates. The actual striking effect is discussed and views of the perforations and broken projectiles given. The salient points to be recorded are the elastic deformation to which the plates become subjected, the plates being broken by the play of elasticity along the cracks, resulting in a perforation of less diameter than that of the projectile. Moreover the best plates are made of metals with a high elastic limit. The permanent local deformities produced are in the nature of a flow of the metal along the lines of least resistance. In soft plates therefore a portion of this flow goes outward from the front face. Harveyizing making a hard skin, the outward flow here is in the shape of splinters, and by the opposition of this hard skin, to the flow of the softer metal below, the resisting power of the plate is increased. The bulk of the metal pushed out goes by way of the rear side, and hence the hole is larger in diameter here than that of the projectile, something like in the punching of rivet holes. The sudden stopping against an inflexible surface on the part of the projectile, compresses it violently, which may cause it to break. To distribute the pressure better a soft steel cap was proposed which allows the pressure to become applied over the whole projectile better and thus aid it in penetration. These soft caps act, so to speak, like lubricants between two hard metals in collision, and have been found uniformly successful where tried. The conclusions arrived at are that if projectiles are improved as rapidly as plates, additional security for vessels is to be looked for in a proper structural combination of horizontal with vertical Harveyized plates, and the coal bunkers, cellular subdivisions, etc., which renders blows of projectiles less dangerous than formerly, and allows less weight of armor. M.

At the American Steel Casting Co.'s plant at Sharon, Pa., the shakers out struck for a one cent an hour advance. They were discharged. Men on the other turn refused to work, also, and part of the molding department is idle.

The Palmer Hardware Co. has purchased the foundry of the Empire Forge Co., at Lansingburgh, N. Y., and will put it in immediate operation.

MACHINE-MADE SAND CORES.

I have been asked by several American founders to give some details of the manufacture of sand-cores as carried on in the foundries of Krupp in Essen, Otto Gruson in Magdeburg, Ganz & Co. in Budapest, etc., where machines are used for this purpose.

The machine itself requires but little description. An iron framed table has in its center a circular countersink 400 mm., say 16 inches, in diameter, into which is dropped the flange of whatever core mold is required; these molds being from 25 mm. (one inch) up to 300 mm. (one foot) in diameter, and of various cross sections, although mostly round. All the molds have the same sized flange, and this has a "bayonet joint" to keep the mold from being shoved up from below with the core. Each mold has a bottom plate which is attached to the top of a rack-rod and fits snugly. Into the rack-rod engages a pinion which is on the same shaft as a large hand-wheel with graduated rim, and a "rider" which may be clamped at any desired point in the rim, so that when it strikes against a stop on the machine frame it limits the motion of the rack to any desired amount, thus governing the core length. The core pipe being set in and centered by a cross piece or spider above, and the false bottom being run down so as to limit the depth of the mold, as shown by the scale on the hand-wheel, sand from the table is next rammed in; then the hand-wheel is turned and the core is shoved up to the table level and removed. The maximum length of core found necessary by some 60 users of these machines in Germany, up to 1897, was 300 mm.—12 inches; Krupp uses 400 mm. as maximum. Cores being of absolutely accurate diameter and perfect cylindricity, are readily placed together endwise to any desired extent. This seems to be the hardest thing to impress on founders, and yet it is one of the most easily demonstrated and regularly done of operations. The first section that is made of a long cylindrical core is made with a smooth core pipe of the full desired length; the other sections are made on a short, smooth section, and slid from the one to the other; or all may be made on short rough pipe-lengths and a junction pipe, if I may use the term, slid through these; this inner pipe having an outer diameter equal to the inner diameter of the short sections, and all having a liberal allowance of perforations, unless the sand is unusually pourous and the sand mass very thick and short in proportion to the pipe diameter, so as to give good vent area. Fig. 1 shows a pieced-together cylindrical core; Fig. 2 a pump air-chamber core, made up of two cylindrical sections, a neck and a top or cup piece. The cup piece is made by first setting on the false bottom of the core mold a cup-shaped wooden or other piece, and then ramming the sand well onto that. It might just as well be made with a cylindrical extension all in one piece, unless the core diameter was a foot, in which case a machine with only 16 inches stroke would not give much cylindrical part. The neck is made by setting another and properly shaped cup-piece on the mold bottom and ramming up well; this time with a core pipe in the center, if desired.

Fig. 1

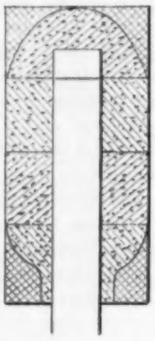

Fig. 2

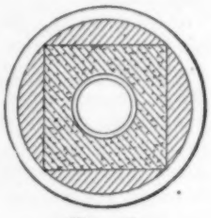

Fig. 3

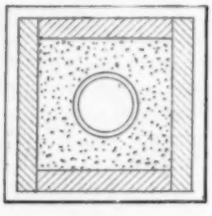

Fig. 4

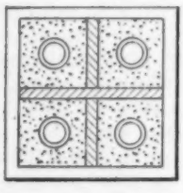

Fig. 5

Fig. 6

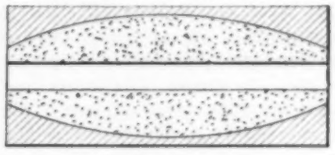

Fig. 7

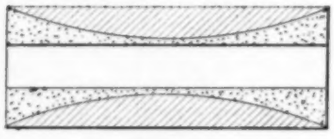

Fig. 8

Fig. 10

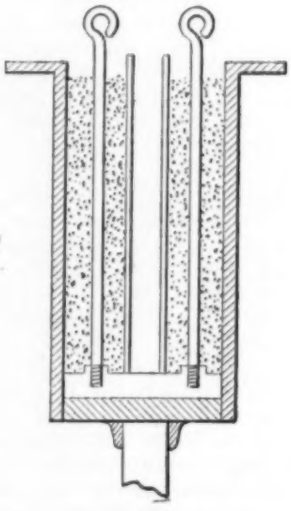

Fig. 9

MACHINE-MADE SAND CORES.

To make a square core, four filling pieces are stood on end in the mold (see Fig. 3), and these, together with the sand that is rammed in among them, are pushed out when the plunger is raised; they are then quickly lifted away. Of course, square core molds are used where there are many square-sectioned cores to be made; and where one of these is made of considerable size, smaller ones may be made by plain, flat board insets (Fig. 4), or four small ones may be made at once by inserting in the large one a cross-shaped partition as in Fig. 5.

For T or X pipe cores, there is laid on the bottom of the core mold a block having one flat circular side and one semi-cylindrical surface bounded by a circle, as in Fig. 6. For a core with a shoulder, a ring is laid on the core bottom. Where there is to be a neck other than at the end, the ring must be in two parts, so that each can be lifted away. A bellied core, as for paper rolls, or an hour-glass core, is made by ramming up a cylindrical mold in which is an inset of suitable length-

wise section, parted lengthwise in the middle (Figs. 7 and 8).

Very heavy cores may be handled quite easily by laying on the mold bottom a metal plate having two or more bosses in which are screwed the ends of core irons having rings at the upper end to permit their being picked up and carried by a crane (Fig. 9).

With these hints as starters, no one should have any difficulty in getting up any kind of a sand core on such a "sausage-stuffer" type of machine. Steam port cores (Fig. 10] are particularly well made, as their sides are smooth, straight where they should be straight, and parallel.—[Robert Grimshaw, in American Machinist.

CONDITION OF BLAST FURNACES OF U. S.*

Sept. 1, 1897.

Location of Furnaces.	Coke and Anthracite					Charcoal.				
		In Blast.		Out of Blast.			In Blast.		Out of Blast.	
	Total No. of Stacks.	Number.	Weekly capacity.	Number.	Weekly capacity.	Total No. of Stacks.	Number.	Weekly capacity	Number.	Weekly capacity.
New York	18	4	4580	14	7487	5	1	84	4	468
New Jersey	8	2	1784	6	2527	.....	.....	.....	.....	.....
Spiegel	3	2	410	1	100	.....	.....	.....	.....	.....
Pennsylvania:						13	1	50	12	695
Lehigh Valley	37	7	4033	30	13480	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	70	.....	.....	.....	.....	.....
Schuylkill Valley	20	4	3201	16	8128	.....	.....	.....	.....	.....
Upper Susqu. Val	8	2	1100	6	2649	.....	.....	.....	.....	.....
Lower Susqu. Val	9	3	3450	6	3303	.....	.....	.....	.....	.....
Spiegel	1	1	520	0	0	.....	.....	.....	.....	.....
Lebanon Valley	13	4	2913	9	4484	.....	.....	.....	.....	.....
Pittsburgh	37	24	52054	3	4446	.....	.....	.....	.....	.....
Spiegel	3	2	2207	1	1004	.....	.....	.....	.....	.....
Shenango Valley	17	7	10990	10	8430	.....	.....	.....	.....	.....
Jun. and Con. Vals	14	4	5509	10	4976	.....	.....	.....	.....	.....
Spiegel	1	1	722	0	0	.....	.....	.....	.....	.....
Youghiogheny Val	3	1	1173	2	1900	.....	.....	.....	.....	.....
Miscellaneous	5	0	0	5	3710	.....	.....	.....	.....	.....
Maryland	5	3	4412	2	1670	4	2	115	3	428
Wheeling District	9	5	6170	4	5118	.....	.....	.....	.....	.....
Ohio:						9	4	223	5	489
Mahoning Valley	11	6	9906	5	6402	.....	.....	.....	.....	.....
Central & Northern	11	8	11240	3	3048	.....	.....	.....	.....	.....
Hocking Valley	2	0	0	2	850	.....	.....	.....	.....	.....
Hanging Rock	12	3	1048	9	2414	.....	.....	.....	.....	.....
Indiana	2	0	0	2	408	.....	.....	.....	.....	.....
Illinois	16	12	21996	4	5200	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	1150	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	3	3023	1	770	3	0	0	3	1465
Missouri	2	0	0	2	740	1	1	370	0	0
Colorado	3	0	0	3	4620	.....	.....	.....	.....	.....
Virginia	24	8	5470	16	8365	4	0	0	4	437
Kentucky	6	2	600	4	2650	3	0	0	3	200
Alabama	39	17	18000	22	14300	12	1	231	11	2594
Michigan	.....	.....	.....	.....	.....	15	6	2365	9	3710
Tennessee	13	5	4500	8	4109	9	2	500	7	2200
Georgia	2	0	0	2	960	3	1	300	2	360
North Carolina	2	0	0	2	600	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	155	9	858
Texas	.....	.....	.....	.....	.....	4	1	162	3	790
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	353	140	180951	213	130897	98	21	4555	77	15144

SUMMARY.

Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	21	20	21	4,555	4,003	6,229	77	78	15,144	15,743
Coke and Anthracite	140	132	124	180,951	161,375	123,271	213	230	130,897	148,825
Total	161	152	145	185,506	165,378	129,500	290	308	146,041	164,568

*The above table is condensed from the *Iron Age*. The tables of the *American Manufacturer* show in blast Sept. 1, 161 furnaces, with 184,055 tons weekly capacity instead of 185,506 as above.

The Foundry Investment Co., St. Louis, has been formed to take over the property of the Ranken & Fritsch Foundry & Machine Co., at St. Louis, which was recently bought at a foreclosure sale for $40,000 by the bondholders. The capital of the new company is $40,000.

A ten per cent advance in the wages of the Pennsylvania Tube Co.'s employes, Pittsburg, will take effect Sept. 20. Between 1,200 and 1,300 men are affected.

PUBLICATIONS RECEIVED.

THE MINERAL INDUSTRY: Its Statistics, Technology and Trade, in the United States and Other Countries to the End of 1896. Vol. V., 865 pages. Edited by Richard P. Rothwell. New York: Scientific Publishing Co.

The fifth of the annual statistical volumes which are issued in lieu of the supplements which the *Engineering and Mining Journal* formerly published, is not essentially different from its predecessors. Many of the same contributors appear again, and in addition to market reviews and summations of technical and commercial progress in lines of mineral production, there are given valuable special articles by contributors whose work has made them familiar with the particular metallurgical developments discussed. Among those which appear in the iron and steel chapter are: "Manufacture of Basic Iron in Alabama," by Dr. Wm. B. Phillips; "Southern Iron and Coal," by Wm. M. Brewer; "The Bertrand-Thiel Process," by E. Bertrand, and "Recent Economies in Iron and Steel Manufacture," by H. G. Graves. Dr. Phillips' article is a comprehensive discussion of basic iron manufacture in the South, going into the composition of ores, fluxes, fuel, with an examination into furnace burdens and their effect upon the quality of the iron. The question, what constitutes good basic iron? is treated at length, and the difficulties that confront the furnaceman in meeting the ordinary requirements, particularly as to silicon and sulphur. Referring to the basic iron thus far made in Alabama, the writer gives leaves from his own experience at the furnace and says: "It is a source of great satisfaction to the pioneers in this movement to realize that in spite of the numerous obstacles, such as irregularity of stock, with its consequent frequent changes of burden, unavoidable experimentation, etc., fully 80 per cent of the iron made was of excellent quality. The average composition of the casts on which this assertion is based, was as follows: Silicon, 0.51 per cent; sulphur, 0.032 per cent; phosphorus, 0.73 per cent. Of the other 20 per cent, fully 15 per cent could be used in admixture with the above in judicious amounts, leaving but five per cent unsuitable for the basic open-hearth." In conclusion, Dr. Phillips says that the production of Alabama pig iron suitable for conversion into steel by the basic open-hearth process may now be considered as established on a commercial basis of unquestionable stability.

IRON AND STEEL AND ALLIED INDUSTRIES IN ALL COUNTRIES. By James M. Swank.

Ninety-four octavo pages are published in advance of the 1896 volume of the Mineral Resources of the United States, giving comprehensive and valuable statistics of the iron and steel industries in this and foreign countries in recent years. The statistics are in the main a transcript from the second part of Mr. Swank's last annual report for the American Iron and Steel Association.

THE MONEY QUESTION. By Henry V. Poor. 8vo., 202 pages. Paper, 50 cents. New York: H. V. & H. W. Poor.

Devoting much space to the history of the Bank of the United States, and the course of currency and banking legislation in the early days of the Federal Government, Mr. Poor traces the financial enactments of the war period and of succeeding years—throughout the recital keeping steadily to the purpose of his work, the advocacy of a return to the currency system established at the foundation of the Government. His method is this: The funding of the notes of the Government, and the creation of a national bank as the custodian of the public revenues, to be receivable and disbursed by means of its notes. The scheme involves also a return to State banks—a procedure which we can only conceive to be fraught with the old dangers attending "wild cat" currency. Mr. Poor's theory is, however, that the issues of all these other banking institutions, restricted to discount of bills of exchange, may be left free, with the certainty that the restrictions imposed upon the National Bank will be imposed upon all. It is declared that the chief object of the work is, "to advocate the emancipation of the banks of the country from the burden now imposed upon them in the form of security for their circulation." The discussion is highly interesting; and though we opine few of our readers will find it possible to endorse Mr. Poor's plans of currency reform, there is much food for thought in his criticism of what exists, and of the well-meant but impracticable suggestions of "bi-metallism" that are put forward in current political deliverances.

STEEL AND IRON AXLES.*

BY E. A. MOULD.

The period we have just passed through might be properly termed the "Iron Age," and should I ask you which metal —steel or iron—you would prefer, for axles, the majority would answer "Iron." Why? Because many have become gray in the manipulation of the same and stand ready to produce the strongest evidence from their years of experience and practical work, from the scrap pile, fagot and finished axle, showing that this metal produces the strongest and best axles to withstand the strains and stresses to which they are subjected, under the heavy loads and high rate of speed of this progressive age.

Our cars have increased—almost doubled—their former capacity and our locomotives with the high pressure of steam make it necessary that an axle be made of the best material possible, in order to meet the requirements of to-day. Iron has been the only material we have had with which to make axles strong enough to withstand the strains to which axles are subjected, through the high speed, high pressure and increased tonnage of this the "Age of Progress."

A necessity for something better, without too large an increase in weight was fully realized and wonderful developments have been made in material for axles, and, in fact, for all portions of car and locomotive forgings. For axles, we have the low carbon steel made by the Bessemer and open-hearth processes, and we find ourselves in what might be called the "Steel Age." I believe it has come to stay, as our scrap piles have now become unfit to produce good iron axles, owing to the impurities which they contain; at least this is our experience in the eastern market. The demand for better material and the spirit of competition soon made steel a strong competitor against iron in the markets of the world, as the proper and best material for axle making:

First—Because of its being more homogeneous than iron.

Second—Because of its being free from seams and soon forming a better bearing than iron.

Third—Greater loads can be borne by steel than by iron axles of the same dimensions.

It was said by one of our members, while this subject was under discussion, at the last convention, that the Bessemer process of making low carbon steel was not reliable for axle making, and, upon investigation, I find that many of the failed steel axles have been made by this process. Upon the Erie system, upon which I am employed, we have been using open-hearth low carbon steel for crank pins, side and main rods, piston rods, locomotive driving axles, engine truck, tender truck, passenger and freight car axles with the most satisfactory results, for a number of years.

Mr. Goodell, our mechanical engineer, has kindly given the records of failures of all classes of axles upon our system, from all causes, and our reports show that 57 iron axles and only 14 steel axles have failed. During the last two years and four months the average rate of failure has been 14 iron and three steel axles per year; the failure of steel axles forming but 18 per cent of the total number of failures. The reports upon which these statistics are based cover axles of all classes, freight and passenger cars, engine truck, engine tender and driving axles.

Almost all the outside bearing axles which have failed have fractured in the journal, the most common cause of failure being seamy and dirty iron, fillets worn sharp, and improper or deficient lubrication, causing journals to run hot. We have generally been able to trace the failure of nearly all of the steel driving axles which have failed to some surface defect, such as circumferential scoring, due to careless lathe work, or cutting, due to wear. The sections of driving axles at which fracture takes place is about in the plane of the inner face of the driving wheel hub. It is very rarely the case that we receive a specimen which indicates a clean break throughout. At the time of ultimate failure, nearly all specimens show that fracture has occurred more or less gradually. We frequently receive broken iron journals, the fractures of which indicate that they have been very hot and that the outside fibres have been severed and that just previous to ultimate failure the journal was kept in shape by a central core of fibres, all of which gave way simultaneously.

In general steel axles are superior to iron axles in homogeneity, in ability to resist abrasion and in ability to resist greater stresses, both quiescent and repeated alternating stresses. Iron axles are made of scrap of good or bad quality, according to the nature of the scrap selected for their composition. To be perfectly sure that iron axles are of the quality specified it is necessary to test each axle in some way or other, for iron is far from being homogeneous. Moreover, in iron axles, there is always some danger of the existence of steel scrap, which never thoroughly unites with the adjacent iron and therefore is a source of weakness and danger.

Steel axles are usually made of new material, and the mass of steel worked at one time, and from which either Bessemer or open-hearth axles are made, is often sufficient to produce from 50 to 75 axles. As this steel is very homogeneous the axles have a physical and chemical composition almost exactly alike, the principal cause of difference being segregation or a separation of certain elementary substances in the steel, such as sulphur, phosphorus, and manganese. Segregation, however, rarely becomes a defect of axles because most steel axle manufacturers discard a certain portion of the top of the ingot, in which portion of the ingot almost all the segregation takes place, and the portions of the ingots used for the manufacture of axles are, generally speaking, free from this defect. Not only are axles of the same heat or run of metal quite homogeneous, but most metals of various heats are so nearly alike that the difference between physical and chemical properties of axles made of metal of various heats are very slight. If it is especially desired that axles shall be exactly alike in physical and chemical composition, axles of certain heats may be especially selected with this in view, the selection of the heats to be used depending upon a careful consideration of the chemical and physical properties of the metal as shown by the manufacturers' tests.

A thorough competitive test of the wearing qualities of iron and steel taken from axles has recently been made by the Cambria Iron Co. In these tests the specimens taken from the different axles were so formed as to present the same extent of wearing surface. Small cubical sections of metal were cut from the journals of the axles as near the surface as the shape of the section would permit, and the faces of these cubes were planed and polished in order to place them in as nearly the same condition as possible. The cubes were then placed upon a steel disc which had been prepared and they were pressed against the disc with a constant pressure, and the disc was made to revolve.

Eight specimens from wrought iron and 17 from steel axles were thus tested. The average loss of weight by wear per unit of surface presented, during 200,000 revolutions, was as 21.26:12.4, for the iron and steel respectively. Seven grades of iron and steel were used in this test, and they withstood abrasion in the following order, the first mentioned suffering the least loss and the last mentioned suffering the greatest loss:

Open-hearth toughened by Coffin process, steel.
Open-hearth, untreated, steel.
Bessemer toughened by Coffin process, steel.
Bessemer, untreated, steel.
Muck, bar-mill scrap, iron.
Western scrap-iron axles.
Eastern scrap-iron axles.

In order to withstand repeated and alternating stresses, for an indefinite length of time, the greatest stresses should be quite a little less than the elastic limit of the material of which the piece so treated is composed. It is customary to so design axles as to make the greatest intensity of stress one-third the ultimate strength of the material; as the ultimate strength and elastic limit of steel are greater than similar properties of iron, it follows that greater loads can be safely borne by steel axles than by iron axles of the same dimensions. With mild steel having a tensile strength of 60,000 lbs. per square inch, and iron having a tensile strength of 50,000 lbs. per square inch, the greatest stresses which axles composed of these materials could withstand without becoming fatigued would be about 20,000 lbs. per square inch and 17,000 lbs. per square inch, respectively.

* A paper by the president of the National Railway Master Blacksmiths' Association, read at the fifth annual convention at Chicago, Sept. 8, 1897.

THE new "Bessemer" road will be carrying ore to Duquesne by Oct. 5.

A CUPOLA ON WHEELS.

In our issue of last week appeared the paper read before the Foundrymen's Association at Philadelphia, describing the method of welding street rails at the joints by the use of cast iron. The illustrations presented on this page, reproduced from the *Street Railway Journal* give an idea of the portable cupola as well as of the process of casting in the iron molds clamped about the joints. The portable cupola shown in Fig. 1 is pivotally suspended from a large truck, like a mariner's compass, so that it is always in a perpendicular position, no matter how rough the road may be.

Coke is carried in a box in front of the cupola, and the pig iron for the heat is piled in front of the coke, under the

FIG. 1.—THE PORTABLE CUPOLA IN USE.

driver's seat and on the platform surrounding the top of the cupola. Mounted on the same truck and back of the cupola is the blower. This, in some of the outfits turned out by the Falk Mfg. Co., of Milwaukee, is operated by an electric motor, with a fan on the motor shaft. Power for the motor is conducted from the trolley wire by a regular trolley pole. The outfits heretofore manufactured have a steam engine in place of the motor for operating the blower, and some now under construction will also be equipped with engines instead of motors, so that they will be entirely independent of power from a street railway company, and can be used equally well on cable roads, where there would be no power for an electric motor.

The weight complete before charging is about 12,000 lbs., and the truck and cupola are handled by three horses abreast. Each outfit is equipped with three ladles, one or two for use and one for reserve. The cupola handles 8,000 to 9,000 lbs. of metal in one heat, and this makes approximately 80 joints. Two heats are run in one day where the workmen are not interrupted by traffic on the road, it requiring about three hours to run a heat and about an equal length of time for the cupola to cool sufficiently for recharging. When work is confined strictly to the night time, after traffic hours, but one heat can be run.

In casting joints, large iron molds are used. These are in pairs and are made hot before being clamped in place at the joint. An auxiliary outfit is provided, termed the mold heater. This wagon has a fire box below, and has three layers of grates arranged inside the box and on which the molds are placed for heating.

FIG. 2.—FILLING THE MOLDS.

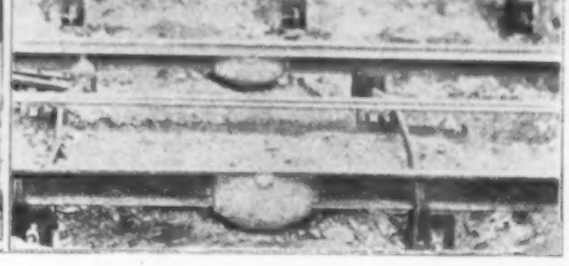

FIG. 3.—COMPLETED JOINT.

PIG IRON FROM A SELLER'S STANDPOINT.

In an interview in the New York *Times*, Mr. Archer Brown, of Rogers, Brown & Co., is quoted as to the situation in foundry iron and the general iron trade outlook: Replying to the question, "Is the recent advance in pig iron justified by market conditions?" Mr. Brown said:

"Unquestionably it is. Stocks commenced to decline in June, and have run off probably 150,000 tons out of about 1,000,000 tons in the past three months. They are declining to-day at a more rapid rate. The accumulated stocks of foundry iron in Alabama, in Chicago, in Buffalo, and in the Mahoning and the Shenango Valleys have dropped away in the past six weeks at the rate that the furnaces themselves have hardly appreciated.

"I greatly deprecate any rapid or artificial advance, but every indication now points to a scarcity of both Northern and Southern foundry irons before the year is over. The trade at large has been impressed with the idea that there was an immense reserve capacity which could be made active at a moment's notice, and that there were large unsold stocks. As a consequence buyers have not been taking hold freely. Of about 4,000 active foundries in the United States it is doubtful if 500 have as much iron bought as it was their previous custom to carry. The remaining 3,500 will need to replenish heavily as the fall months come on if business continues to improve as it is now doing.

"At the first sign of scarcity consumers get excited and bid for twice as much as they actually need; thus artificial conditions are created and a so-called boom comes on when there is no occasion for it. And everybody knows that a boom is against the best interests of the iron trade. But history has repeated itself at almost regular intervals in the iron trade in this particular, and will doubtless continue to do so as long as pig iron is produced and melted.

"The first 25 cents per ton advance comes the hardest of all. Furnace companies which have found it hard to sell at prices perhaps below cost lack confidence, their own agents and brokers are skeptical, and buyers are serenely apathetic. But when the more sagacious and well-informed make large contracts at a small advance and a further rise comes in the natural order, bears change to bulls over night and the material is eagerly demanded at full prices. That is exactly what we are seeing to-day. It is easier to sell a thousand tons to-day at top prices than it was a hundred tons a month ago at the bottom.

"How much further the American iron markets will improve depends entirely on the broadening of commercial business, manufacturing, and particularly new construction of every kind throughout the United States. It can only be said that the prospects at the moment are as bright as the most optimistic could desire."

"Do you believe there is a scarcity of iron in the British market?"

"It is a significant fact, to which the *Times* has already called attention, that iron stocks in England and Scotland have steadily declined since Jan. 1. The total shrinkage has been about 250,000 tons, or, roughly, 25 per cent of the stocks of Jan. 1. What is still more significant is that each week's shipments take up the current product and draw further from stocks. And this despite the fact that there is in progress in England a gigantic strike of engineers, which has closed scores of large foundries and temporarily checked the demand."

THE rod mill of the New Castle (Pa.) Wire Nail Co. has started up.

THE DINGLEY BILL AND MEXICAN TRADE.

Dixie, of Atlanta, in its September issue, comments on some objections made by the Mexican press to the Dingley bill. One City of Mexico paper says that "Mexico finds in the new tariff nothing that confirms the pretended desire for more intimate trade intercourse" and adds that "Pan-Americanism has become in the eyes of all Latin-Americans a mere by-word." *Dixie* in the course of its article notes the following commodities on which Mexico exacts a duty:

Crockery, per lb	$ 07	Wheat, per bushel	$ 1 40
Plain cotton cloth, sq. yd	08	Bottled spirits, per gal.	2 00
Window glass, per lb	10	Calfskin boots or shoes, pair.	2 50
Laundry soap, per lb	12	Woolen cloth, medium, sq.yd.	3 00
Cured meats, hams, etc., per lb.	12	Nails, per keg	5 00
Writing paper, per lb	12	Flour, per barrel	9 00
Leather belt, per lb	25	Bedstead, with spr'gs, 150 lbs.	18 00
Candles, per lb	35	Roll top office desk, 200 lbs.	25 00
Canned fruit, per qt	60	Piano, 800 lbs.	184 00
Hats, each	1 00	Carriage, 1,000 lbs.	230 00

Our contemporary then comments as follows:

"This schedule makes it appear that Mexico believes very strongly in the virtues of a high tariff. It is true that these duties are payable in the money of that country, but it must be remembered that we accept the same money in payment for our commodities, and profits can be counted only after the money has been returned to this country and reduced to a standard basis. The question naturally arises, Why does Mexico impose these high duties on imports? The explanation is very simple indeed: She wishes to encourage home manufacture, and more than this, she needs the revenue so derived. The policy is entirely consistent with wise government, and no reasonable argument can be offered against it. Our tariff schedule was created with identically the same purpose in view, and its defence of our industrial interests is justifiable and righteous.

"Mexico's tariff laws were made in the interests of Mexico, and the Dingley bill was enacted with a view to benefiting the commercial interests of the United States. It is quite possible that, in the arrangement of her schedules, Mexico did not give our interests very much more consideration than the framers of the Dingley bill gave to the interests of Mexico. We grant free entry to Mexico's coffee and sisal grass because these two commodities are not produced in the United States. We produce hides, lead, tobacco and fruit, and the tariff on these articles is levied in the interests of our producers, and not in malice toward Mexico. Mexico grants free entry to our machinery for the reason that her people are not engaged in its manufacture, and, more than this, machinery is essential to the development of that country's natural resources. She taxes our other products for the purpose of public revenue, and, incidentally, to encourage home manufacture.

"The Mexicans believe that some of our tariff charges bear too heavily upon their commerce, but surely they will not deny that some of their rates are a serious embarrassment to our people. But for these high duties our manufacturers would double their sales in Mexico within the next 12 months. Possibly there are some commodities upon which the Mexicans would agree to reduce the tariff, provided like concessions were made on the products that they wish to sell us. There are a number of articles upon which our neighbor levies a duty that are not manufactured in Mexico, and in all probability, will not be made there for many years to come. Upon such articles Mexico might make concessions, in which case we might equalize matters by reducing our rate on hides and fruit. Such agreements are not only possible, but are provided for in our present tariff law.

"Under the terms of the Dingley bill, the President may reduce the tariff as much as 20 per cent on any article named in the dutiable list, and enter upon an agreement to maintain the reduction for five years. Or, upon commodities now in the dutiable list, and not produced in the United States, the President may order a transfer to the free list, and guarantee retention on that list for at least five years. This discretionary power is given to the President in order that he may enter into negotiations with the various countries trading with the United States, and, when concessions have been mutually agreed upon, the reductions may become operative without the necessity of waiting for the action of Congress.

"It is this policy, then, that must be depended upon for the equitable adjustment of tariff rates. Treaties for reciprocal benefits must be undertaken, and, in mutual good faith, these treaties must be maintained. Our Government has not yet been forgiven by certain of the Latin-American countries for the unrighteous abrogation of certain agreements of this character entered upon a few years ago, and, on this account, it will be necessary for us to take the initiative in the work of restoring and extending this policy. By enactment of Congress agreements may now be entered upon for a fixed term of years. Thus the possibility of abrogation is done away with.

"We have never had a commercial treaty of this charactr with Mexico, but President Diaz has recently said to the writer of this article that he heartily favors the policy. He did everything in his power for the success of the Grant-Romero treaty, which was the first effort ever made for reciprocal trade benefits between the republics of this continent. That measure was defeated in our Congress, and President Diaz has said that he could not urge the matter a second time, but that he stood ready to give it friendly consideration whenever it might be brought to his attention by our Government. This feeling, no doubt, obtains with other Latin-American governments, and it is incumbent upon us to give these people practical and substantial evidence that we believe very earnestly in what has come to be known as Pan-Americanism. Let us invite the confidence and the co-operation of all Latin-America."

PROFITS OF TIN PLATE MANUFACTURE.

Much has been said pro and con as regards the profit in tin plate making under present conditions, a subject on which little is known outside of the trade. When it is considered that there is scarcely a line in iron and steel manufacture where the amount of money handled per year is so large in proportion to the capital investment, that the labor cost of a box of tin plate is greater than the cost of the steel in it, that the individual experience of certain makers has resulted in important cost reductions, and that the fluctuations in the market from month to month are frequently equivalent to a fair profit per box, it should be readily seen that one works may be making a handsome profit, and another may be losing money, though selling in the same market. We know it to be a fact that the differences in cost at different plants are in themselves sufficient to represent good profits on the capital investment. The balance lies with the makers who have well and modernly equipped plants, good locations as regards freight rates on raw and finished materials, well organized forces of men, and ample working capital. So important are the points we have just mentioned, that an established market, usually considered of such especial value in a manufacturing enterprise, is of relatively minor importance.

The possible "overdoing" of the tin plate business has come in for more than its share of comment. Usually, it may be taken that when a trade is overdone, there is little or no profit in it for anyone. It is not so in tin plate. A very few cents a box ultimate profit means a fair return on investment, while these few cents profit are to be made on an expenditure of say $3. We can readily conceive the possibility of there being twice the productive capacity in the country needed, and yet certain of the favored manufacturers making a fair profit. If the increase in capacity in the next few years is greater than the increase in demand, a case which can hardly be considered probable, then it will be a survival of the fittest, and it will take only the weight of a straw to make a plant fit or unfit. The fittest, who are at the head of the column, need not fear being seriously affected.—[Tin and Terne.

The Iron & Steel Export Co., of Pittsburg, formed to take charge of the export trade of six large hoop and cotton tie mills, is doing a good business, over 2,000 tons of hoops and bands having been shipped abroad already from these mills. One of the largest shipments just made abroad was of hoop iron to the Wah Kee Tea Co., of Pekin, China. This order was filled by the Union Iron & Steel Co., of Youngstown, and an order for another large consignment has just been received. The manager of the new company, F. L. Clark, of Wm. Clark's Son & Co., made a trip to Europe recently to canvass the situation and it was found to be favorable for very considerable additions to this trade. China and Japan and South America are regarded as especially good customers for these products.

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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Bellwood Mfg. Co., Bellwood, Pa., capital $12,000, commencing with $1,200, has been incorporated to conduct a general foundry and machine business.

The Monessen Water Co., of Monessen, Pa., has been organized and will install a water works plant at the town site in Westmoreland County.

The Chicago Horseshoe Co., 1119 Ashland Blk., Chicago, is in the market for a small second-hand shear, to cut one-half by one and a half inch iron.

There is some figuring on new machinery and boilers for the Aragon mine at Norway, Mich.

At Jackson, Mich., a co-operative foundry will begin operations this week under the name of the Central City Co-operative Foundry Co. The principal stockholders will be A. C. Smith, who will be general manager; Geo. J. Buchfink, and Geo. Schaat. Each workman employed will have a personal interest in the business. The company will do a general foundry business, and in addition will manufacture the Jackson valve box.

The Semi-Steel Casting Co., of Montpelier, Ind., has been incorporated with a capital stock of $10,000.

J. B. Kelly, Sanford, N. C., wants catalogues of general blacksmithing machinery.

C. A. Moross Co., Chattanooga, Tenn., wants prices on three rock-drills, with tripods, also on 80-h. p. boiler and engine.

Lee Bros., Memphis, Tenn., are in the market for a pipe cutting machine, to cut to eight inches, inclusive.

Romaine Automatic Agricultural Machine Co., Toronto, Ont., capital $500,000, has been incorporated to manufacture and operate automatic agricultural machines.

Bids will soon be asked, it is reported, for the machinery required in a new beet sugar factory to be erected near Goshen, Utah, by the Mount Nebo Land, Irrigation & Canal Co. The entire plant will cost about $500,000.

New Construction:—

The proposed buildings of the new Sheffield rolling mill company are a puddling mill 60x243 feet, and a finishing mill 100x148 feet.

The bid of the Youngstown Bridge Co., Youngstown, O., for the new Market st. viaduct, $169,550 has brought it the contract. The viaduct will be 1,610 feet long and the river span will be 185 feet above low water mark.

The Leechburg Land & Improvement Co., at Leechburg, Pa., will erect a plant for the manufacture of cold rolled steel and other steel specialties.

Subscriptions to the new co-operative rolling mill, to be built at Scottdale, Pa., have reached $72,000, and a site in North Scottdale has been offered for the plant. The balance of the $100,000, it is said, can be had at any time, and it is probable the committees will meet within a week or ten days and complete the organization of the company.

The new plant under erection for some time by the Standard Boiler & Bridge Co., at Bellaire, O., is almost completed.

The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for the new boiler house which the New York Belting & Packing Co. is putting up at Passaic, N. J. The building will be entirely fire-proof, brick walls, with steel roof trusses covered with the Berlin Iron Bridge Co.'s patent anti-condensation corrugated iron covering.

Another sheet mill is talked of at Cambridge, O. Col. J. D. Taylor, one of the original stockholders of the Cambridge Iron & Steel Co., is at the head of the new movement.

The General Electric Co., Schenectady, N. Y., has the contract for the electrical machinery for the new plant of the Deering Harvester Works, Chicago.

Additions, Enlargements, Removals, Etc.:—

The Dangler Stove Co., Cleveland, will erect an addition to its plant at the corner of Perkins and C. & P. Railway, to cost $4,000.

The Schoen Pressed Steel Co., of Pittsburg, is doubling the capacity of its plant at Allegheny, Pa., by the erection of three steel buildings 600x120 feet, 400x120 feet and 325x90 feet. They will be equipped with machinery of the most modern design, including seven electric cranes, hydraulic presses, punches and riveters. When these additions are completed the plant can turn out 500 tons of pressed steel shapes per day. The Schoen Pressed Steel Co. was the concern that took the contract for 600 all steel cars for the Pittsburg, Bessemer & Lake Erie Railroad. It has been turning out these cars very fast for some time, and more than half of them have been completed.

Darby Bros., of Kansas City, Mo., have moved into the large plant formerly occupied by the Keystone Iron Works. The new works are thoroughly equipped with modern tools.

The Chicago & Northwestern Railroad is contemplating making improvements in the roundhouse and machine shops at Baraboo, Wis. The company recently purchased two acres of land to enlarge its yards.

Reese, Hammond & Co., of Bolivar, have commenced the erection of a new plant with a producing capacity of 30,000 bricks a day. They now employ 125 men at their works, and this addition will greatly increase the force.

Fires and Accidents:—

The foundry and machine shops of John Rice & Brother Co., Stevens Point, Wis., were almost entirely destroyed by fire Sept. 1. The machines are very little damaged, mostly by water.

An accident occurred at the plant of the Farrel Foundry & Machine Co., Ansonia, Conn., on Aug. 30. In pouring a ladle containing about three tons of molten iron into smaller ladles, the gear on the large ladle broke and the molten iron was tipped over on to the ground. About 14 men were burned by the iron, but the majority of them only slightly.

At Brooklyn, N. Y., the general repair shops, together with 19 cars, of the Nassua Electric R. R. Co., were destroyed by fire on Sept. 4. Reported loss, $75,000; insurance on building, $34,000.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ⁂ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

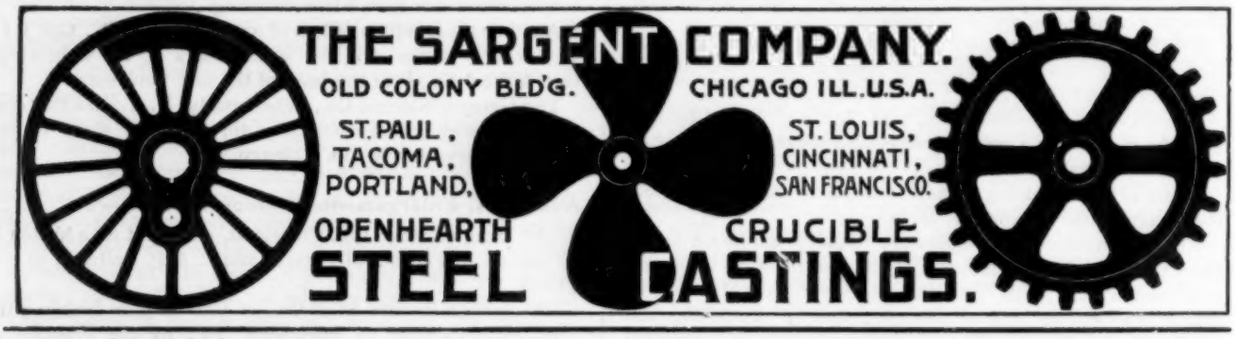
SEMI-STEEL Machinery Castings of All Kinds.

Cylinders, Rolls, Dies, Etc.

Castings Furnished Within Two Days After Receiving Patterns.

40,000 LBS. TENSILE STRENGTH. GIVE US A TRIAL.

SEMI-STEEL CO., KING & ANDREWS CO., Proprietors, Chicago.



OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

Head Office and Works, CLEVELAND, OHIO.

Agencies: NEW YORK, 97 Cedar St. CHICAGO, Old Colony Bldg.
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.

General Industrial Notes:—

The Pittsburg Testing Laboratory, Ltd., Pittsburg, has been commissioned to inspect the machinery and steel used in connection with the work of the Drainage Commission of New Orleans, La. This includes the inspection of the compound condensing engines and the centrifugal and screw pumps to be built by the E. P. Allis Co., Milwaukee, the Babcock & Wilcox boilers, the generators and motors to be furnished by the General Electric Co., and 1,500 tons of rolled steel at the Homestead Works of the Carnegie Steel Co., Ltd.

Col. Thomas Sharp, president of the Spathite Iron Co., of Nashville, Tenn., and others have purchased the Vanderbilt Furnace at East Birmingham, and will put it in repair for the production of spathite iron.

Upon executions issued on judgments entered in the circuit court last week for $30,102 the sheriff levied upon the plant of the American Cycle Mfg. Co., Chicago. The assets are placed at $190,000, and liabilities at $90,000.

The Chesapeake & Ohio and the Big Four have each ordered 1,000 box cars from the Pullman Palace Car Co., and the Louisville & Nashville has ordered 500 box cars from the United States Car Co. The Buffalo, Rochester & Pittsburg has placed an additional order with the Buffalo Car Mfg. Co. for 100 freight cars. St. Charles (Mo.) Car Co. is building 200 freight cars for the Missouri Southwestern. The Baldwin Locomotive Works have received an order for seven ten-wheel locomotives from the Houston, East & West Texas Railway.

The rolling mill plant of F. W. Wurster & Co., at Brooklyn, N. Y., has resumed operations.

The Tyler Tube & Pipe Co., Washington, Pa., manufacturer of charcoal iron boiler tubes, has completed the making of 60 tons of boiler tubes for the Japanese battleship Kasagi, which is being built at Newport News, Va. They were made under the supervision of imperial experts. The same concern is now making tubes for United States battleships Nos. 7 and 8, in course of construction by the Cramp Ship & Engine Building Co., of Philadelphia, Pa.

The new Union Tube & Iron Co., recently organized at Warren, O., has elected the following officers: Warner Arms, of Niles, O., president; D. P. Wheeler, of Akron, vice-president, and F. M. Peet, of Warren, secretary.

The Union Trust Co., Detroit, Mich., has been appointed receiver of the Crescent Brass & Iron Works, of that place.

The Napier Furnace, at Napier, Tenn., is being made ready to blow in.

The Bath Iron Works, Lewiston, Me., will do away entirely with steam for power to run its machinery in all its departments and five additional motors will be placed in position to furnish sufficient electricity to perform the work. At present there are six motors in operation.

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.

MACHINE TOOLS AND SUPPLIES.

Some SECOND-HAND TOOLS in stock.

1—8-ft. Boring Mill.
1—No. "D" Horizontal Boring & Drilling Machine.
1—19-in. Putnam Slotter.
4—No. 11 Brown & Sharpe Milling Machines.
2—No. 1½ Stiles Presses.
1—No. 3 Stiles Press.
1—36-in. G. & E. Spur Gear Cutter.
2— Crank Planers.
3—No. 1 Brown & Sharpe Screw Machines.
2—No. 6 Brown & Sharpe Screw Machines.
1—36-in. Car-wheel Borer.
1—55-in. Pneumatic Riveter.
1—30-in. Pulley Lathe.
1—30-in Pulley Borer.
1—Pratt & Whitney Turret Lathe.
1—109-in. Engine Lathe.
1—15-in. Fox Turret Lathe.
1—20-in. Lodge-Davis Turret Lathe.
1—20-in. x 10-ft. Gleason Engine Lathe.
1—3-Spindle Drill Press.
2—30-in. Drill Presses.

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CONSULTING AND CONTRACTING ENGINEER.

Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.

Automatic Billet Heating Furnaces. **Plans and estimates furnished.**

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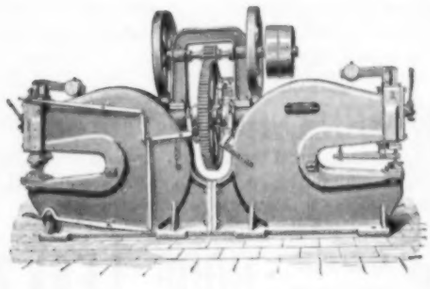
For Iron and Steel Furnaces, Glass Furnaces, etc.

SPECIAL SHAPES MADE TO ORDER.

DIAMOND FIRE BRICK WORKS,

AKRON, OHIO.



THE LONG & ALLSTATTER CO.,

HAMILTON, OHIO,

MANUFACTURERS OF

POWER PUNCHING AND SHEARING MACHINERY.

Belt, Steam or Electrically Driven.

For Heavy or Light Work.

The plant of the United States Car Co., Anniston, Ala., has resumed operations. The company has just closed a contract with the Louisville & Nashville Railroad Co. to build 500 box cars. The resumption will give employment to about 700 men.

The Lucknow Forge, near Harrisburg, Pa., idle since 1893, is expected to be put in operation soon.

The Glasgow Rolling Mill, Pottstown, Pa., is to resume after an idleness of nearly a year.

The Crane Iron Works, at Catasauqua, Pa., is receiving large consignments of foreign and local ores at present, preparing for the winter season.

The Cohoes Tube Works, Troy, N. Y., is enlarging and rebuilding one of the bell furnaces. The other furnaces are running as usual.

The Gibbs Electric Co., of Milwaukee, Wis., has sold all its interests to the Westinghouse Electric & Mfg. Co., of Pittsburg. The Gibbs company made electric dynamos and motors, paying especial attention to the manufacture of machines for direct connection to machine tools. The Gibbs Electric Co. has been represented by Kohler Bros., Monadnock Blk., Chicago, who have been sole agents for the sale of the Gibbs products. Kohler Bros. say the sale does not affect their interests, but that they will continue to handle the Gibbs machines. Arrangements have not yet been completed, but it is likely that the machines will continue to be built in Milwaukee by the Westinghouse company.

The B. & O. erecting and repair shops in Baltimore have been completely modernized. The locomotive erecting shop has been rebuilt. It is supplied with two 50-ton electric cranes.

It is reported that the Westinghouse Electric & Mfg. Co. has been awarded by the Metropolitan Electrical Supply Co. the contract for a large electric lighting plant to be installed in London. The apparatus will be of the multiphase type, involving the use of the Tesla patents. It is said that the contract amounts to between $350,000 and $400,000. All of the electrical apparatus will be made at the works of the company at East Pittsburg, Pa.

The Humbert Tin Plate Co., Connellsville, Pa., will substitute natural gas for coal as fuel. The Fayette Gas Fuel Co. is now laying an eight-inch branch from its main line.

General Manager Shook, of the Tennessee Coal, Iron & Railroad Co., and a delegation of Alabama Congressmen will lay before the naval armor plate committee the advantages of the Birmingham district for the economical manufacture of steel for armor plate.

A company is being organized to take charge of the Arethusa sheet mill at New Castle, Pa., the property of George W. Johnson, and convert it into a six-mill tin plate plant.

The repairs at the Shenango Valley Steel Co.'s plant, New Castle, Pa., are nearly completed and it is expected the mill will resume by Sept. 25. The engines and rolls have been rebuilt, and when finished will be in shape for a long run. Work on the foundation of the bar mill is progressing rapidly. It is expected that it will start up March 1.

The Pennsylvania Steel Co. was the lowest bidder on a big bridge contract at New Bedford, Mass., last week, the bids ranging from $98,000 to $121,500.

The relining of the new furnace of the Thomas Iron Works, at Hokendauqua, is being advanced, and the new blast stoves are well up. The furnace has been considerably enlarged.

The Sternbergh Bolt & Nut Works, at Reading, has about 600 men at work on full time in its mills at that place and shipments are being made to Australia, Africa, and India. Business is reported as better.

The second pit of plant B, at the National Pipe & Foundry Works, Scottdale, has been put in operation. This places the entire mill in operation, turning out a large amount of pipe each day, requiring over 200 tons of pig iron daily. The pit started is operated by three electric cranes and electric machinery of all kinds.

The despatches concerning the sale of rails by the Johnson Co., of Lorain, O., for shipment to Ireland, have added a

cipher to the amount actually taken. The order is for 2,000 tons.

The Joseph Dixon Crucible Co., Jersey City, N. J., is placing on the market a graphite preparation designed to prevent the adherence of spelter when not wanted in brazing work.

The E. P. Allis Co., Milwaukee, Wis., has recently shipped eight car loads of mining machinery to South Africa. The company is at work on six large engines for the London Central Underground Railway.

Secretary Dyke Williams, of the Link Belt Machinery Co., Chicago, in a recent interview said about the company's business: "Our books show that we did more business between Aug. 1 and 25 than ever before in the history of the concern. Business has been picking up for the past two months, and we are now employing at least 25 per cent more men in our factory than we were three months ago, and if orders continue to come in at the rate at which they have for the past month we will soon have to work night as well as day. This we will not do if it can be avoided, for it is decidedly unsatisfactory, but if we do it will almost double our present force."

The Buffalo Car Mfg. Co., Buffalo, N. Y., has started its machinery after a five months' shut down, according to report. It is said that 600 men will be employed on full time.

The Etna Foundry & Machine Co., Springfield, Ill., has increased its capital stock from $15,000 to $25,000.

Wm. C. Lane and Flavell McGhee have been appointed receivers for the United States Car Co., in Illinois, Ohio, Alabama and New Jersey, and the former receiver for the property of the company in New York State. J. M. Maris, general manager of the company, has been appointed agent for the receivers. The suit which has brought about the receivership is a friendly one, and a new company is now being organized that will probably be incorporated under the laws of the State of Illinois to take over all the property and business of the old company. The company was originally organized with a capital of $3,500,000, and owned property at Hegwisch, Ill., Anniston and Decatur, Ala., and Urbana, O. The assets are estimated to be $1,124,570. The bonded indebtedness is $4,027,165, and there is due $737,089 in interest, $14,437 to employes, and $47,639 on miscellaneous accounts.

In another column, Geo. J. Norman, trustee, offers for sale a valuable rolling mill property, with natural gas wells, coal rights, etc. It is located at Leechburg, Pa., 35 miles from Pittsburg, and was occupied formerly by the Jennings Bros. Co.

The Carnegie Steel Co., Ltd., has placed an order with the Newton Machine Tool Works, Philadelphia, for four rail-ending machines and one cold saw, to be placed in the Homestead works.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

Valuable Rolling Mill
FOR SALE.

Property Located at LEECHBURG, PENNA., 35 miles from Pittsburg, on the West Penn Division P. R. R.

These premises comprise 5 acres of valuable ground, upon which is erected a

New Iron Building,
Modern Sheet Mill,
fully equipped, consisting of
3 SHEET MILLS or 4 TIN MILLS
—AND—
3 COLD ROLL MILLS.
SUITABLE BUILDINGS with PICKLING Appliances, Annealing Furnaces, Machine Shop, etc., etc.

2 NATURAL GAS WELLS
Perpetual rights to mine
COAL
on about 100 acres of land located near the mills.

For terms of sale, and further information, address

Geo. J Gorman, Trustee,
Lock Box 119. PITTSBURG, PA.

ARE YOU LOOKING
FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee Mississippi and Louisiana, and possess

FINE SITES FOR NEW MILLS,
BEST OF FREIGHT FACILITIES,
CLOSE PROXIMITY TO
COAL FIELDS AND DISTRIBUTING CENTERS
AND
INTELLIGENT HELP OF ALL KINDS,
MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

100 Cities and Towns WANTING INDUSTRIES

This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

To sound industries, which will bear investigation, substantial inducements will be given by many of the places on the lines of the Illinois Central R. R., which is the only road under one management running through from the North. Western States to the Gulf of Mexico. GEO. C. POWER, Industrial Commissioner I. C. R. R. Co., 506 Central Station, Chicago. I-2-'94

DOES YOUR ROOF LEAK?

If an old leaky tin, iron or steel roof, paint it with Allen's Anti-Rust Japan. One coat is enough; no skill required; costs little; lasts long.

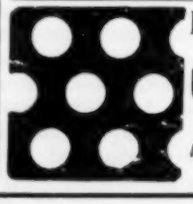
The name describes it; proof against water, time, climate, and fumes of every description. Stops leaks, and prolongs the life of an old roof.

If you want evidence write us.

To be returned at our expense if not satisfactory.

This Anti-Rust is also of highest value in protecting metal pipes, fans, etc., at mines, exposed to the corroding effects of *mine air* and *mine water*.

ALLEN ANTI-RUST MFG. CO.,
413 Vine St., Cincinnati, O.



Perforated Sheet Metals
—FOR—
ORE, COAL, SAND
and all uses.
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NON-ARCING AUTOMATIC CIRCUIT BREAKERS

GUARANTEED TO OPERATE PERFECTLY OR NO PAY. MADE FOR ALTERNATING OR DIRECT CURRENT. ANY VOLTAGE. CATALOGUE FREE.

AUTOMATIC CIRCUIT BREAKER COMPANY. NEWAYGO. MICHIGAN. U. S. A.

Manufacturers

Don't continue in the old rut and rust out.
Be progressive—keep in touch with the times.

Move to Chicago Heights

where you can reduce the cost of production and cheaply distribute the product of the factory to the consumer.

Free Factory Sites.

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THE LARGEST REAL ESTATE FIRM IN AMERICA.

Capital Paid in $1,250,000.00.

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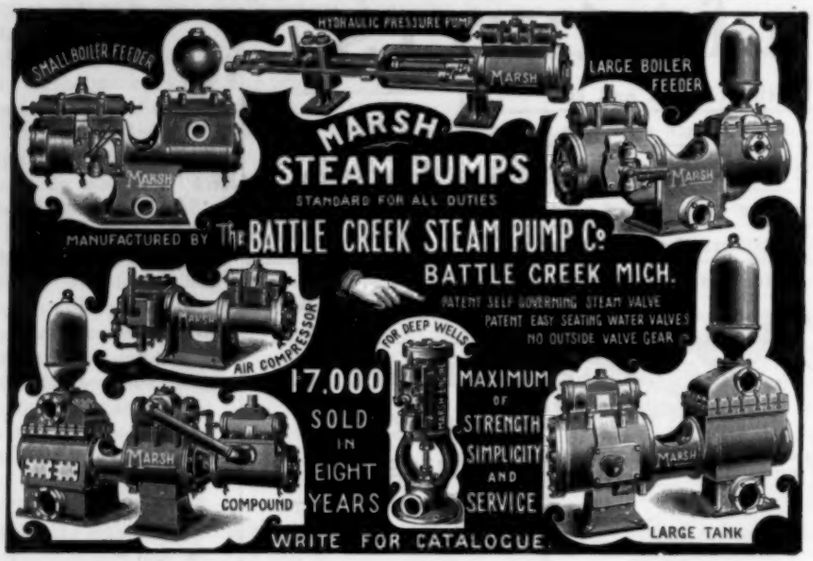
Corner Fifth Avenue. CHICAGO.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

H. R. McCULLOUGH,
GENERAL FREIGHT AGENT.
CHICAGO.



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HENRY R. WORTHINGTON,

NEW YORK.

Boston. Philadelphia. Chicago. Cleveland. St. Louis. Indianapolis. Detroit. Atlanta. Pittsburg.

SEND FOR CATALOGUE.

THE 1896 EDITION

OF THE

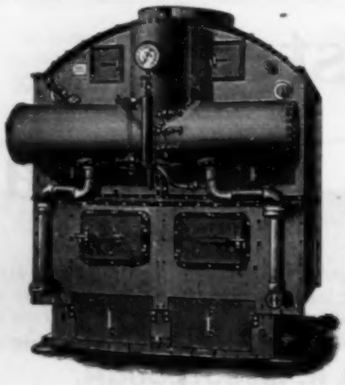
Iron and Steel Directory

Will be sent postpaid by *The Iron Trade Review* at $6.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

The Iron Trade Review

is an increasingly valuable medium through which to sell equipment to machine shop and foundries.



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PATENT SECTIONAL WATER TUBE BOILERS

FOR

Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats, Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

This Boiler possesses more advantages than any other Boiler.

It has STOOD THE TEST of over seven years' constant daily use in passenger steamers, and is in use in many of the best steam yachts. It has proved its durability to be equalled by none. It has shown from 10 to 15 per cent saving in every day work over the best Marine Fire-Tube Boiler.

It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive. No priming, and easy to manage.

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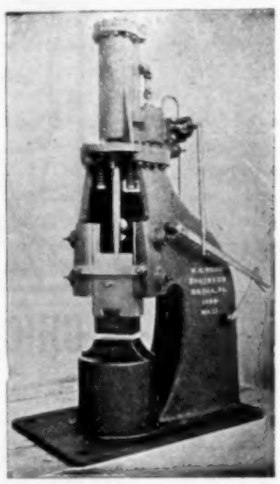

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Accumulators, Cranes, Pumps, Etc.

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TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
*Daily. †Daily except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	7: [illegible]	[illegible]
Salem and Pittsburg	* 8:00 am	* 8:30 p
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

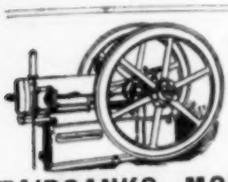
FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:50 am	* 5:30 pm
Akron and Columbus	* 8:50 am	* 5:30 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R. Co.

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:00 A M	*3:30 P M
Akron, Canton & Chicago	*8:10 A M	*6:35 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:25 P M	†11:00 A

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.



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Electric Lighting and **Water Works Plants** for factories and residences a specialty.

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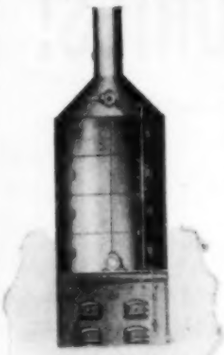

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STEEL JACKET, LINED WITH BRICK.
SINGLE BOILERS OR COMPACT BATTERIES.
GREAT SAVING OF FLOOR SPACE AND FUEL.
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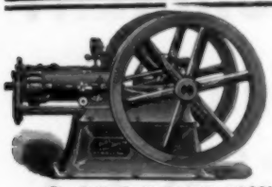
Telephone 1219, 18th St. N. Y. GENERAL OFFICE:
Cable Address, "Palls," N. Y **716 East 13th St., NEW YORK, U. S. A.**



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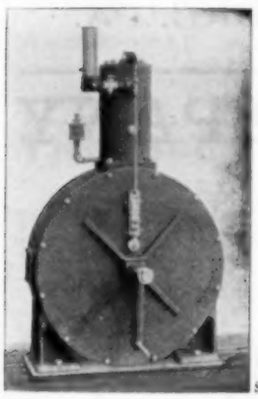
THE ENGINE that built a 10,000 square ft. addition last year.

BECAUSE { No gears or levers,
Simplest carburetor,
Wonderful Economy,

KNOW the REQUIREMENTS of a Gas Engine.

OLDS & SON ENGINE WORKS, LANSING, MICH.



THE "BRIGHTON"

GAS AND GASOLINE ENGINES

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CLAIMS.

RELIABILITY,
DURABILITY,
SIMPLICITY,
ECONOMY.

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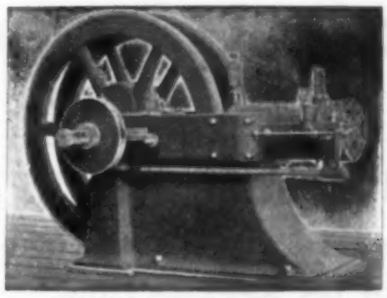

VERTICAL TYPE.—½ to 3½ actual h. p.

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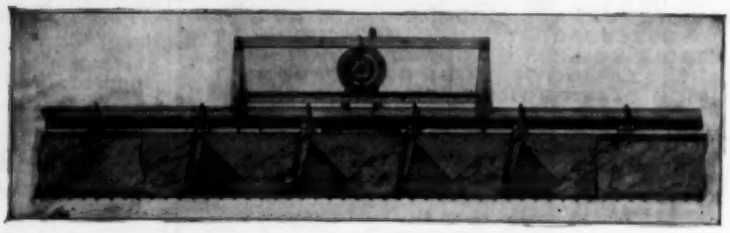

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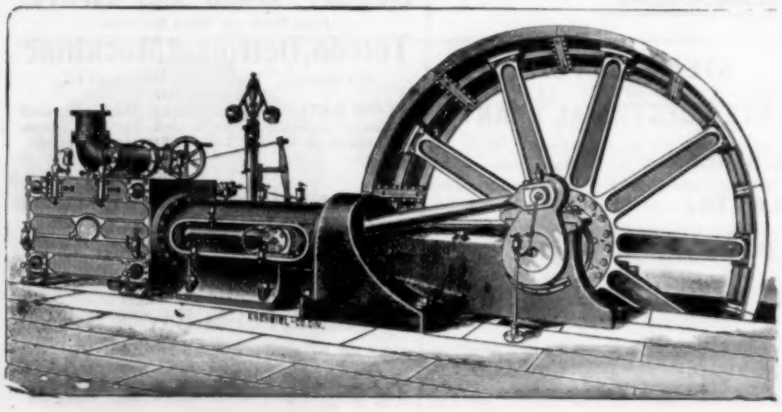

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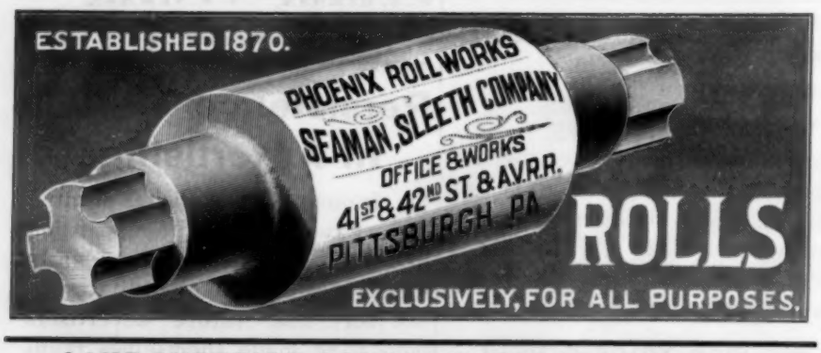

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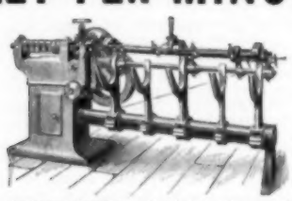

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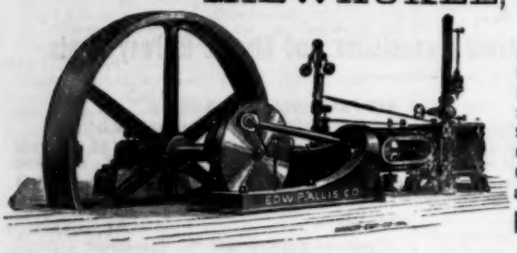

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	PAGE
Adt & Son, John	27
Ætna-Standard Iron & Steel Co.	26
Aitchison, Rob't Perforated Metal Co.	31
Allen Anti-Rust Mfg. Co.	20
Allis & Co., Edward P.	30
Almy Water Tube Boiler Co.	22
Apollo Iron & Steel Co.	1
Automatic Circuit Breaker Co.	20
Bacon, Earle C.	27
Baird Machinery Co.	19
Beckley & Co., A. J.	20
Battle Creek Steam Pump Co.	22
Besly & Co., C. H.	36
Bethlehem Iron Co.	35
*Berger Mfg. Co.	—
*Bertsch & Co	—
Bickford, H.	36
Bosworth W. H	27
Bourne-Fuller Co.	26
Brightman Furnace Co.	33
*Brown, Edward	36
Bucyrus Steam Shovel & Dredge Co.	24
Cahall Sales Department	1
Cambria Iron Co.	26
Card Electric Co.	35
Case Mfg. Co.	1
Central Electrotype & Engraving Co	23
Charter Gas Engine Co.	36
Chicago & Northwestern Ry.	33
Chicago Screw Co.	1
Clayton Air Compressor Works	2
Clay Co., Oliver P.	1
Clearfield Fire Brick Co.	35
Cleveland & Buffalo Transit Co.	25
Cleveland City Forge & Iron Co.	1
Cleveland Electrotype Co.	25
*Cleveland Galvanizing Works	—
Cleveland Rolling Mill Co.	26
Clinton Iron & Steel Co.	26
*Clonbrock Steam Boiler Co.	—
*C. M. & St. P. Ry.	—
Cole, J. Wendell	36
*Coshocton Foundry Co.	23
Crane & Co., B. P.	35
Detroit & Cleveland Steam Navigation Co.	23
*Diamond Fire Brick Works	19
Dickman & MacKenzie	1
*Dietz, Schumacher & Boye	31
Dixon, Jos. Crucible Co.	27
Dover Fire Brick Co.	35
Drake, Bates & Co.	26
Emmerton, F. A.	2
Enterprise Boiler Co.	1
Erikson, Edward E.	19
Fairbanks, Morse & Co.	23
*Fix Sons	—
Fleharty, J. H. & Co.	2
Forster, Waterbury & Co.	1
†Fulton Steam Boiler Wks. & Fdy. Co.	—
Gates Iron Works	2
General Electric Co.	24
Gerlach, Peter & Co.	35
Glader, Wm.	2
Gobeille Pattern Co.	31
Hanna & Co., M. A.	26
Harrington & King Perforating Co.	36
Harrington, Son & Co., Edwin	36
Harrison Safety Boiler Works	17
Hartford Steam Boiler Insp. & Ins. Co.	35
‡Hazelton Boiler Co.	23
Heyl & Patterson	24
Hooven, Owens & Rentschler Co.	24
Illinois Central R. R.	20
Iron Clad Paint Co.	31
Jeffrey Mfg. Co.	27
Jenkins Bros	31
Jones Foundry Co., W. A.	1
Jackson Sand Mining Co	31
King & Andrews Co	18
Lane & Bodley	32
Lake Superior Consolidated Iron Mines	26
Link-Belt Machinery Co.	33
Lloyd Booth Co.	34
*Lodge & Shipley Machine Tool Co.	—
Long & Allstatter Co.	19
Lorain Foundry Co.	1
Lunkenheimer Co., The	34
Magnolia Metal Co.	1
Marine Iron Works	20
Marion Steam Shovel Co.	35
Meehan Boiler & Construction Co.	36
Moore Mfg. Co.	1
Nolte Brass Co.	2
North American Metaline Co.	36
Norwalk Iron Works Co.	2
Nuttall Co. The R. D.	32
Oglebay, Norton & Co.	26
†Ohio Sand Co.	—
Olds & Son	23
Otis Steel Co.	18
Perkins Machine Co.	35
Phillips Testing Laboratory, The	34
Pickands, Brown & Co.	2
Pierce-Crouch Engine Co.	23
Pittman, C. K.	2
Pittsburg Tool Steel Co.	27
Pollock, Wm. B. & Co.	2
Playford Stoker Co.	34
Prouty Co., The	2
Rand Drill Co.	2
Rand, Chas. F., Prest.	26
Reading Crane & Hoist Works	22
Reese, Hammond & Co.	36
Rockwell & Co., W. S.	33
Rogers & Hubbard Co.	27
Sargent Co., The	18
Seaman, Sleeth Co.	26
‖Sharon Fire Brick Works	1
Shiffler Bridge Co.	26
Shultz Belting Co.	1
Stilwell-Bierce & Smith-Vaile Co.	2
Stuart Fire Brick Co.	33
Sturtevant Co., B. F.	1-25
Sykes Iron Roofing Co.	34
Textor, O.	2
Tod, Wm. & Co.	34
Toledo Machine & Tool Co.	35
Turner, Vaughn & Taylor Co.	27
Union Mining Co.	18
Upson Nut Co.	1
Westinghouse Electric & Mfg. Co.	29
Westinghouse, Church, Kerr & Co.	23
Westinghouse Machine Co.	27
Wood, Wm. H.	22
Worthington, Henry R.	22
Wellman Seaver Engineering Co.	36

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No. 2 Gray Forge, neutral	9 65
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" " Mottled	8 25@ 8 50
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Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$14 00
Old steel rails (6 ft. and over)	10 50
Old steel rails (6 ft. and under)	10 00
Old car wheels	11 00
	NET TONS
No. 1 R. R. wrought scrap	$11 50
Mill scrap	8 50
No. 1 Machine cast scrap	8 00
Iron axles	15 00
Axle turnings	8 00
Wrought turnings (free from cast)	6 50
Cast borings	5 25
Uncut wrought iron boilers	5 50
Steel boiler plates	8 00
Grate bars	5 25
Pipes and flues (clean)	7 50
Tank iron	7 00
Hoop and band iron	6 50
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.05c
Tees	1.15c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1¾	1.00 Base.
2 to 2¾	.20 extra.
3 to 3½	.50 "
3½ to 4	.80 "
4½ to 4½	1.00 "
4½ to 5	1.30 "
5½ to 6	1.80 "
6½ to 6½	2.20 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

We Claim The Following Merits for Jenkins Bros.' Valves

1 Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory. (2)
6. ALL GENUINE stamped with Trade Mark,

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.

FOR SALE, CHEAP SECOND-HAND TOOLS.

5—14 ins. x 6 ft. Lathes. 2—14 ins. x 8 ft. Lathes. 3—16 ins. x 6 ft. Lathes. 1—10 ins. x 8 ft. Lathe. 2—18 ins. x 6 ft. Lathes. 6—18 ins. x 8 ft. Lathes 3—18 ins. x 10 ft. Lathes. 1—18 ins. x 12 ft. Lathe. 1—22 ins. x 12 ft. Lathe. 3—24 ins. x 12 ft. Lathes. 1—26 ins. x 12 ft. Lathe. 1—26 ins. x 14 ft. Lathe. 1—26 ins. x 16 ft. Lathe. 1—30 ins. x 12 ft. Lathe. 2—52 ins. Radial Drills. 2—80 ins. Radial Drills. 36 ins. x 36 ins. x 16 ft. Planer, Double Head.

All of these tools are the latest improved and just as good as new, and can be seen at our ware-rooms on Second Street, Cincinnati.

Dietz, Schumacher & Boye, Cincinnati, O

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

THE JACKSON SAND MINING CO.,

JACKSON, O.

Producers of SILICA, FIRE and CORE SAND. Also MOLDING SAND for STEEL CASTINGS. Write for Prices.

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1142 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¾	2.50 extra.
¾ to ⅞	.10 "
⅞ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅛ to 1	1.05 Base.
4¼ to 6 x ⅛ to 1	.10 extra.
6¼ to 8 x ⅛ to 1	.60 "
8¼ to 10 x ⅛ to 1	.80 "
1⅛ to 4 x 1 1-16 to 1¼	.30 "
4¼ to 6 x 1 1-16 to 1¼	.40 "
6¼ to 8 x 1 1-16 to 1¼	.60 "
8¼ to 10 x 1 1-16 to 1¼	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¼ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1½ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¼ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
¼ to 6 x Nos. 10, 11 and 12	.60 "
1½ to 4 x No. 9 to 3-16	.40 "
1½ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40
⅜ x No. 9 to 3-16	1.50
⅜ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
⅝ to 9-16 x 3-16	1.00 "
⅞ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
		Extras.	
1⅛ to 6,	" 10, 11, 12 or ¼"	.05	per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10	"
1 to 1⅜,	" 10, 11, 12 or ¼"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10 11, 12 or ¼"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10 11, 12 or ¼"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or ¼"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or ¼"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or ¼"	1.05	"

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.		
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.50	Base
		Extras	
1 7-16 to 2,	" 17, 18, and 19	.05	per 100 lbs
1 7-16 to 2,	" 20	.10	"
1 7-16 to 2,	" 21	.15	
1 7-16 to 1¾,	" 22	.25	
1 ⅛ to 1⅜,	" 13, 14 and 15	.05	
1⅛ to 1¾	" 16, 17 and 18	.10	

F. A. ESTEP, Pres. & Treas. J. R. McGINLEY, Vice Pres't. THOS. FAWCUS, Supt.

R. D. NUTTALL CO.,

99 BOQUET STREET, ALLEGHENY, PA.

ROLLING MILL,

BRIDGE, MINING,

HEAVY DUTY

GEARS AND PINIONS.

This is 4-inch Circular Pitch.

We Cut Involute, Epicycloidal or Special Teeth.

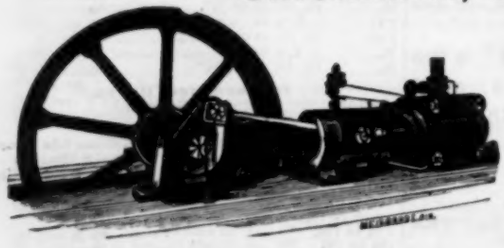
Spur, Bevel or Spiral Gears. Racks, Quadrants and Worm Gearing.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1¼ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅜ to 1½,	"	21	.20 "
1¾ to 1⅞,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
3⁄8,	"	13, 14 and 15	1.00 "
3⁄8,	"	16, 17 and 18	1.10 "
3⁄8,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

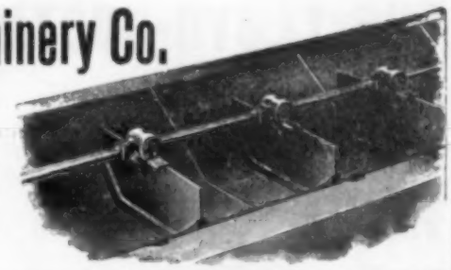
English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

The Link-Belt Machinery Co.

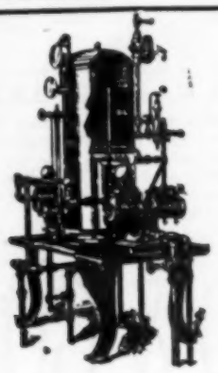
ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.



Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



IMPROVED DUPLEX SYSTEM

- - - FOR - - -

BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

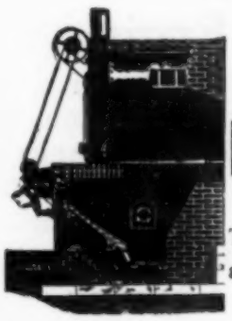
Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05
Above includes plates 90 inches wide.	
90 to 96 in. wide	¼c. lb extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅛ to 4 in.	.09½
⅝ to 11-16 and 4⅛	.10
¼ to 6 in.	.10½
¾ to 9-32 and 6¼ to 7 in	.11
1 in.	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 60
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four 10s				.62
Butt " " "			four 10s	.62½
Lap " galv. "			four 10s	.52½
Butt " " "			four 10s	.50
Boiler tubes 2¼" and smaller				.70
Boiler tubes 2½" and larger				.75
Casting screw and socket joint				dis. 52½
Casing inserted joint				dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti Friction Metal, 25 cts. per lb., f. o. b. New York or Chicago.

No Name Metal, 18 cts. per lb., f. o. b. New York or Chicago.

Mystic Metal, 8 cts. per lb., f. o. b. New York or Chicago.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 5 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3¾
Iron, steel points	₩ lb 4

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1⅝"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1⅝"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, F. F
Kegs, ℔ lb	4½c	5 c	2½c
½ kegs ℔ lb	4¾c	5¼c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Crant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 10c
" " " " over 5 lbs. 8c

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5⅝	4½	4	3½	3⅛
Hexagon	15⅛	11⅝	8⅝	6	5⅛	5⅛	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ℔ keg, base.
Car lots $1 30
Less than car lots $1 40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in. ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2¾ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 35c
Copper ..... dis 35c
Bright and annealed, Nos. 0@18 ..... dis 70&10&75
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list ..... dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis65& 5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

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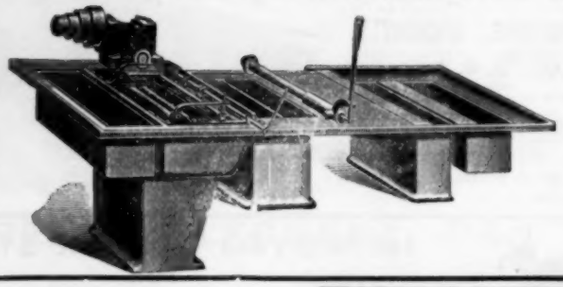

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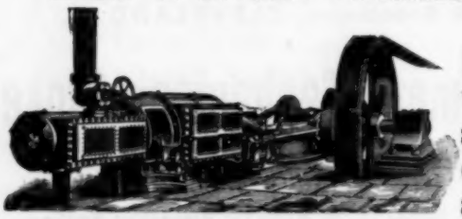

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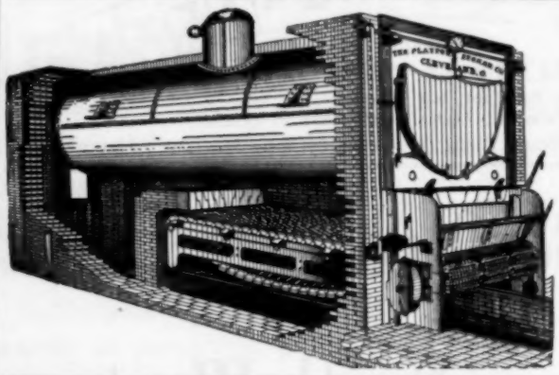

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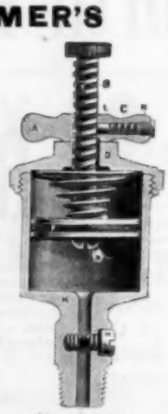

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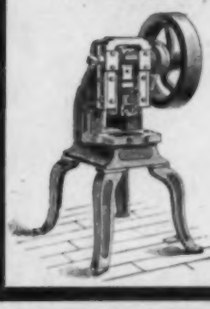
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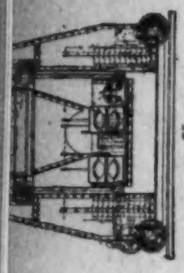

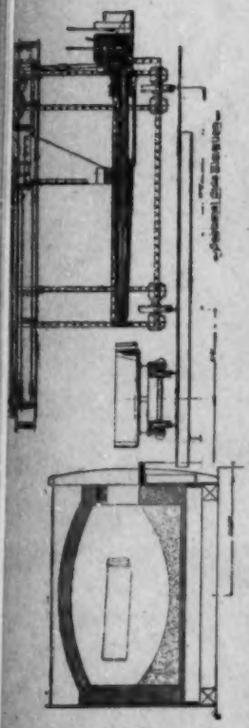

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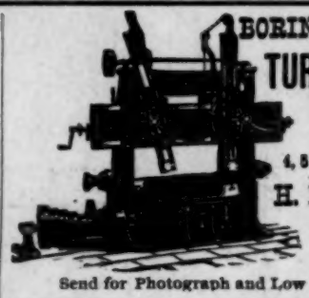

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